Before The
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Review of the Spectrum Sharing Plan	)	IB Docket No. 02-364
Among Non-Geostationary Satellite Orbit	)	
Mobile Satellite Service Systems in the	)	
1.6/2.4 GHz Bands	)	
	)	

JOINT COMMENTS OF L/Q LICENSEE, INC., GLOBALSTAR, L.P. AND GLOBALSTAR USA, L.L.C.

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SUMMARY

In these Joint Comments, L/Q Licensee, Inc., Globalstar, L.P., and Globalstar USA, L.L.C. (collectively "Globalstar"), explain why the Commission must not modify the existing spectrum plan for the Big LEO Mobile-Satellite Service ("MSS"). Globalstar is using fully the spectrum assigned for CDMA systems, while the Iridium system does not appear to be making full use of its assigned spectrum. Therefore, the spectrum assignments for CDMA and TDMA systems serve the current needs of the operational systems.

The Globalstar Big LEO MSS system is using its entire spectrum assignment of 11.35 MHz on the return (earth-to-space) link and 16.5 MHz on the forward (space-to-earth) link to provide satellite services to a steadily-increasing number of subscribers. Globalstar needs multiple return and forward link channels because of the mix of services offered over the system (aviation, voice, data, simplex telemetry and ancillary terrestrial services). The differing regulatory restrictions applicable to portions of the L-band and the differing channelizations necessary to provide acceptable quality of service mandate that certain services have access to separate channels.

The Globalstar system has been designed to take advantage of the asymmetric spectrum assignments for CDMA systems in L-band (11.35 MHz) and S-band (16.5 MHz). Changing the bandwidth available to Globalstar would impair its capacity and ability to provide the variety of services desired by the MSS marketplace. The protection requirements for Radio Astronomy and the Global

Navigation Satellite System limit capacity in the lower L-band and dictate that CDMA systems have access to sufficient spectrum in higher L-band frequencies to move users because of these interservice protection constraints.

Based on publicly available information about the Iridium system, Iridium should be able to serve over half a million subscribers in the Continental United States in its assigned spectrum. However, Globalstar's observations of Iridium's actual operations indicate that it has adopted a less efficient frequency reuse plan and is devoting significant spectrum resources to system overhead, which reduces its spectrum efficiency to approximately 11% of its theoretical capacity. Iridium's inefficient spectrum usage does not justify any larger assignment of Big LEO spectrum.

Moreover, Iridium's bidirectional system design with return and forward links in the Big LEO L-band does not technically permit it to establish an ancillary terrestrial component ("ATC") for its Big LEO system in L-band alone, even if it were assigned additional L-band spectrum. Until Iridium sets forth a feasible plan to provide ATC, Iridium's proposed provision of ATC is irrelevant to the Big LEO band plan.

The Big LEO spectrum is the only spectrum available for Globalstar to meet its current and future subscriber needs. Although the MSS market was not immediately as large as what the Big LEO system licensees anticipated ten years ago, Globalstar subscribers and minutes of use have been steadily increasing since the system commenced commercial service in 2000. MSS remains the only service

that can provide an accessible telecommunications infrastructure globally and provide service despite natural disasters, wars and terrorist attacks. The importance of MSS is demonstrated repeatedly by the number and types of public safety and government users that make use of MSS services. The Commission must retain the entire allocation for Big LEO MSS to support the existing systems' subscribers and the need for these critical telecommunications services.

The various spectrum reassignment schemes proposed by Iridium must all be rejected. Iridium has apparently discovered that its technical design is simply not as flexible or as efficient as is needed to meet the current MSS marketplace. That, however, does not require the Commission to hamstring the Globalstar system by taking away spectrum. Iridium chose its technical design for competitive reasons ten years ago. It still has a competitive advantage because it has access to 2 GHz MSS spectrum, while Globalstar does not. The Commission must allow the systems to continue to compete in their assigned spectrum and to adjust their technical parameters in the future if warranted to achieve greater flexibility and efficiency in the existing Big LEO spectrum.

In any event, the Commission cannot modify the spectrum assignments for Globalstar and Iridium without complying with the requirements of Sections 316 and 312 of the Communications Act of 1934, as amended. Those requirements include a notification of the specific modification, an opportunity for protest and a hearing in which the Commission, not the licensee, has the burden of proof.

Moreover, the Commission cannot take spectrum from Globalstar based on some previously unannounced traffic standard or demand expectation. The Globalstar system has met all requirements imposed under the Big LEO rules. Due process, as applied to administrative proceedings, requires that the Commission announce any new standard and give licensees a reasonable opportunity to meet it before taking action to impair the spectrum rights under their existing licenses.

Based on the information presented in these Joint Comments, the Commission must retain the current Big LEO spectrum plan as is, and must retain all Big LEO MSS spectrum for Big LEO MSS systems.

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JOINT COMMENTS OF L/Q LICENSEE, INC., GLOBALSTAR, L.P. AND GLOBALSTAR USA, L.L.C.

Pursuant to Section 1.415 of the Commission's Rules (47 C.F.R. § 1.415), L/Q Licensee, Inc. ("LQL"), Globalstar, L.P. ("GLP"), and Globalstar USA, L.L.C. ("GUSA") (collectively, "Globalstar"), hereby submit these comments on the Notice of Proposed Rulemaking ("NPRM") in IB Docket No. 02-364.[1]

LQL is the licensee of the Globalstar Mobile-Satellite Service ("MSS") satellite constellation operating in the 1.6/2.4 GHz bands[2] and the successor to the initial applicant for the Globalstar system that participated in the first (and only) processing round for Big LEO MSS systems, including the Negotiated Rulemaking

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[1] See Report and Order and Notice of Proposed Rulemaking, FCC 03-15 (released Feb. 10, 2003), 18 FCC Rcd 1962, published at 68 Fed. Reg. 33666 (June 5, 2003).

[2] See Loral Qualcomm Partnership, L.P., 10 FCC Rcd 2333 (Int'l Bur. 1995).

("NRM") in CC Docket No. 92-166.[3] GLP is the manager of the global MSS business using the Globalstar satellite constellation. GUSA is the United States service provider for the Globalstar system, and licensee of the Mobile Earth Terminals ("METs") and Clifton, Texas, gateway earth station associated with the MSS system.[4]

INTRODUCTION

When it adopted the Big LEO band plan in 1994, the Commission stated that it might consider in a future rulemaking reassignment of 3.1 MHz of L-band (between 1618.25 MHz and 1621.35 MHz) from the 11.35 MHz assigned for CDMA systems "based upon the circumstances that have developed at that time."[5] The Commission expressly declined to find that an "automatic" halving of the available L-band spectrum was appropriate if only one CDMA and one TDMA system became operational.[6] Rather, the Commission stated that it would consider several factors, including the impact of the burdens imposed by interservice sharing constraints in

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[3] See Amendment of the Commission's Rules to Establish Rules and Policies Pertaining to a Mobile Satellite Service in the 1610-1626.5/2483.5-2500 MHz Frequency Bands, 9 FCC Rcd 5934 (1994) ("Big LEO Rules Order"), modified on recon., 11 FCC Rcd 12861 (1996).

[4] See AirTouch Satellite Services US, Inc., 14 FCC Rcd 17328 (Int'l Bur. 1999).

[5] Big LEO Rules Order, 9 FCC Rcd at 5960.

[6] Id. at 5959-60.

the lower L-band, international coordination agreements, system loading and system efficiency.

As demonstrated herein, the "circumstances" at this time do not warrant modifying the Big LEO band plan. Specifically:

- In the United States, the Globalstar system is using fully and efficiently the 11.35 MHz of L-band and 16.5 MHz of S-band assigned for Big LEO CDMA systems;
- Globalstar offers a variety of unique telecommunications services in the U.S. and globally to niche and underserved markets, and serves a steadily-increasing number of subscribers, now over 93,000 worldwide;
- The interservice sharing constraints on use of the lower L-band (1610-1616 MHz) by Globalstar that were recognized in 1994 as attributable to protection of Radio Astronomy observations and protection of the Global Navigation Satellite System ("GNSS") are still present and burdensome;
- The Iridium system has not reached its capacity in the Big LEO TDMA spectrum assignment and is not using its assigned frequencies efficiently; and,
- All the available Big LEO spectrum is needed to support the MSS services provided by Globalstar and Iridium.

Although the Commission initiated this rulemaking based on Iridium's alleged need for more spectrum, the Commission also recognized that Iridium had not adequately documented any such need to justify modification of the band plan. (See NPRM, ¶ 267.) Indeed, when the facts supporting the above conclusions are considered, it is clear that no change to the Big LEO band plan is justified at this time.

The Commission's initial effort to divide the Big LEO spectrum has proven workable and should continue. For the most part, the existing Big LEO systems

and the services in bands adjacent to the Big LEO spectrum are still operating under principles that were thoroughly vetted during the Big LEO NRM in 1993.

How to accommodate all six then pending 1.6/2.4 GHz applicants was one of three major topics of discussion for the NRM. Although the NRM participants were unable to reach consensus, during the subsequent Big LEO rulemaking the current Big LEO band plan was an acceptable compromise to the parties and met the Commission's primary objective of guaranteeing multiple entry in the emerging MSS marketplace. The Globalstar and Iridium systems, the only Big LEO systems launched to date, have had to evolve their business plans to adapt to a much different marketplace for MSS than they anticipated in the early 1990s and to survive the economic recession of the early 2000s. They have suffered through financial restructuring along with hundreds of other telecommunications companies in the last three years. And, as more fully explained herein, Globalstar has developed new MSS services in reliance upon the existing band plan.

What has remained unchanged throughout the past decade is an MSS licensee's need for access to sufficient spectrum to establish and develop a competitive business. Much time, energy and analysis were devoted to debating spectrum issues during the NRM; identical spectrum-related issues have been debated with respect to L-band MSS and 2 GHz MSS. The Globalstar and Iridium systems were built to take advantage of, and in reliance upon, the rules under which they were subsequently licensed as CDMA and TDMA systems, respectively. Both have been operational for several years, and provide important

telecommunications services, including services for public safety and national defense. Given the success of the Big LEO rules generally, Globalstar believes that the technical principles underlying the operations of the current Big LEO systems should not be lightly cast aside. There is, of course, newly available information about MSS markets and the operational systems, but this information also supports retention of the existing Big LEO band plan.

In view of Globalstar's current and future needs for spectrum, as discussed below, the Commission must maintain the current Big LEO allocation as is. There is no reasonable way for the Big LEO systems to operate viable businesses with less spectrum than is currently available for 1.6/2.4 GHz MSS. Accordingly, Globalstar urges the Commission not to reduce the spectrum available for Globalstar individually and the Big LEO systems jointly.

I. GLOBALSTAR IS USING THE BIG LEO CDMA SPECTRUM FULLY AND EFFICIENTLY FOR A VARIETY OF SERVICES.

Currently, the Globalstar system is serving approximately 93,000 subscribers globally. In the United States, the system operates in the Big LEO MSS spectrum assigned to CDMA systems, that is, 1610-1621.35 MHz for the uplink and 2483.5-2500 MHz for the downlink. Globalstar's susbscribership has grown steadily since the system started operation—despite bankruptcy and virtually no advertising budget for more than two years. For the past two calendar years, there have been substantial annual increases in subscribership (111% from December 2000 to December 2001, and 29% from December 2001 to December 2002). In the first half

of 2003, there has been another 13% increase over December 2002. (See Attachment A.)

In North America (including the United States, Caribbean and Canada), Globalstar services have experienced similar increases in subscribers, increasing from 9,370 subscribers at the end of 2001, to 20,347 at the end of 2002, up to 40,916 as of June 2003. (See Attachment A.) Minutes of use have showed corresponding steady increases in the past 30 months. Not surprisingly, there was a sharp spike in usage during the third quarter of 2001, attributable to usage on and following the events of September 11, 2001. (See Attachment A.)

Globalstar's subscriber services have been developed to take advantage of the available spectrum and to overcome various interservice protection constraints on use of the spectrum that were recognized during the Big LEO NRM. Reducing the spectrum available to Globalstar would have a serious impact on its ability to provide the existing services and to compete in the market for MSS, which would, in turn, adversely impact Globalstar's subscribers.

A. The CDMA Spectrum Is Fully Utilized.

The Globalstar system transmits and receives on 1.23 MHz CDMA channels. The Commission licensed LQL and GUSA for nine channels on the return link (uplink) at L-band and thirteen channels on the forward link (downlink) at S-band. Globalstar's spectrum usage plan requires access to all these channels, based on the need for channel diversity, the regulatory restrictions on the specific frequencies, and anticipated capacity requirements. Globalstar has provided this information in

various rulemakings over the years, and the attached Technical Appendix explains the details that are summarized below.

Multiple L- and S-band channels are necessary to support the different types of services and markets that have developed for the Globalstar system. As explained in the Technical Appendix (§ 1.1), Globalstar offers three distinct types of services that require separate channels: (1) a voice/data service with relatively slow-moving users; (2) an aviation service with higher data rates and users moving very rapidly; and (3) a simplex telemetry service which uses a distinct modulation and spreading scheme.

Globalstar's aviation service is subject to several limitations in channel usage. The aviation equipment has been built to meet standards set by the Federal Aviation Administration ("FAA") and RTCA, Inc., for the protection of GPS and GLONASS (collectively, the Global Navigation Satellite System, or "GNSS") operating in the 1574-1610 MHz band.[7] To meet these standards, Globalstar's aviation services in L-band operate above 1616 MHz (that is, on L-band Channels 6, 7, 8 and 9). Moreover, the speed of airplanes using the aviation service, commonly moving through two or more gateway coverage areas, dictates that Globalstar must allocate two separate channels for the aviation services.

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[7] See RTCA, Inc., "Minimal Operational Performance Standards for Avionics Supporting Next Generation Satellite Systems (NGSS)," RTCA/DO-262 (Dec. 14, 2000).

The simplex telemetry service uses a 2.5 MHz channelization, rather than the typical 1.23 MHz channel of the voice and data services. Therefore, the telemetry service requires a separate assignment of two channels to ensure a commercially-acceptable quality of service.

In addition, as Globalstar has explained in the ATC docket,[8] to implement ATC, Globalstar intends to assign at least one return link and one forward link channel for ATC in specific geographic (urban) areas. Outside those areas, the channels would be reused for MSS. However, within a certain area, the ATC channels would not also be available for MSS. (See Tech. App., § 1.2.)

Accordingly, in various geographic areas, Globalstar would be assigning at least one channel to ATC, two to aviation, two to remote telemetry. On the return link, that leaves only four channels to support standard voice and data transmissions. While there would be more channels available for voice and data services on the forward link, the realizable capacity of the forward link channels is less than the realizable capacity of the return link channels due to the differences in regulatory restrictions, as explained below.

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[8] See GLP's Response to FCC Public Notice 02-554, IB Dkt. No. 01-185 (filed Mar. 22, 2003); GLP's Ex Parte Presentation, IB Dkt. No. 01-185 (filed June 27, 2002); Flexibility for Delivery of Communications by Mobile Satellite Service Providers in the 2 GHz Band, the L-Band, and the 1.6/2.4 GHz Bands, 18 FCC Rcd 1962, 2055-56 (2003) ("ATC Report and Order").

B. Globalstar Must Have Access to More S-Band than L-Band Spectrum.

In the United States, there is an asymmetric assignment for CDMA Big LEO systems, nine return link (i.e., user-to-satellite link) channels and thirteen forward link (i.e., satellite-to-user link) channels. As explained in the Technical Appendix (§ 3), the capacity of calls on the forward link is restricted by the applicable Power Flux Density ("PFD") limits. The PFD limits on the forward link limit the number of simultaneous calls per channel per beam.

To maintain the balance of duplex calls between forward and return links, Globalstar designed its system to carry more L-band users per channel per beam on the return link. The capacity of a return link channel is about 1.4 times (approximately equal to 16.5/11.35) larger than the capacity of an S-band channel. Thus, the fact that there are nine L-band channels available on the return link and thirteen S-band channels available on the forward link was taken into account in the design of the Globalstar system, and the capacity is balanced between the two bands.

The EIRP of the return link is not restricted to the same degree as the downlink PFD; rather, EIRP is restricted by size, weight and power limitations on mobile earth terminals ("METs"), the out-of-band emissions limits for protection of GNSS,[9] and limits on human exposure to RF radiation. Given the relatively low EIRP at which the METs operate, Globalstar can achieve the ratio between L-band

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[9] See Big LEO Rules Order, 9 FCC Rcd at 5987-90.

and S-band only with careful planning, state-of-the-art design and dynamic management of both the satellite and the METs. If Globalstar's spectrum assignment is modified, then the forward and return link constraints would be changed, affecting overall capacity on the system. Loss of S-band channels alone would reduce capacity on the system because the applicable PFD limits prevent adding more users per S-band channel to make up for any lost channels.

C. Interservice Sharing Restricts CDMA Spectrum Usage.

Balancing the return and forward links is made even more challenging by the restrictions on use of the lower four L-band channels attributable to sharing with the Radio-Astronomy Service ("RAS") and protecting GNSS below 1610 MHz. The interservice protection rules, which affect primarily the CDMA L-band segment, restrict the ability of the Globalstar system to make full use of its assigned spectrum, and require Globalstar to tolerate interference at S-band. Accordingly, as recognized during the Big LEO NRM, the lower and upper portions of the L-band are not equivalent in terms of usability for MSS capacity, and a licensee of the lower L-band frequencies needs channels above 1616 MHz to place users to meet the interservice protection requirements.

Specifically, to protect RAS sites during observations at 1610.6-1613.8 MHz, Globalstar has had to establish two sets of exclusion zones in which METs may not operate co-channel with RAS. Transmissions from METs in those exclusion zones at observation times must be placed in Channel 6 and above for certain exclusion

zones and Channel 4 or above for other smaller exclusion zones.[10] (See Tech. App., § 2.2.)

The out-of-band emissions limits adopted to protect GNSS also affect Globalstar's freedom to transmit in the lower L-band channels.[11] The closer an MET is operating to the 1610 MHz band edge, the more difficult it becomes to meet the limits. Currently, all Globalstar METs meet the existing out-of-band emissions limits in Section 25.216 of the Commission's Rules. (See Tech. App., § 2.1.) Accordingly, the L-band channels not only need to carry more links than S-band, the various protection requirements impose restrictions on transmit power and distribution of calls. Therefore, any reduction in the L-band spectrum available to Globalstar can impair the type or quality of services provided by the system. Iridium generally does not have to bear the burden of these limitations because it operates at a far enough remove from GNSS and RAS.[12] As the Commission recognized in 1994,[13] splitting the available Big LEO L-band evenly between CDMA and TDMA systems would be unfair because it would grant the TDMA system substantially more unencumbered L-band spectrum than the CDMA system.

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[10] See 47 C.F.R. § 25.213(a).

[11] See 47 C.F.R. § 25.216.

[12] As described below (§ IV.A), it is unlikely that Iridium would adequately protect RAS if Iridium did operate below its existing L-band assignment.

[13] See Big LEO Rules Order, 9 FCC Rcd at 5960.

In addition to the PFD limits on S-band discussed above, in the United States, the S-band frequencies at 2483.5-2500 MHz are shared with Part 18 Industrial, Scientific and Medical ("ISM") equipment, which include microwave ovens, door openers, high frequency lighting systems and medical equipment. In 1993, the NRM estimated that there were over 80 million microwave ovens in operation in the United States and over 200 million worldwide. There have probably been enormous increases in these numbers during the past 10 years. The NRM Report found that ISM equipment poses a significant interference risk for MSS systems, and that suppression of ISM emissions is unlikely to be a possible solution to protect MSS.[14] Fortunately, most ISM equipment operates indoors, and so, is somewhat shielded. But, essentially, MSS systems operating in S-band must tolerate interference from ISM equipment, recognizing that the ISM emission levels will be substantially higher in urban areas where such equipment is prevalent. Therefore, it is essential that a maximum amount of S-band be available for MSS channels to account for the existing and potential increased interference from ISM equipment.

II. IRIDIUM DOES NOT MAKE FULL OR EFFICIENT USE OF ITS ASSIGNED SPECTRUM.

Before the Commission can consider allowing Iridium access to any additional Big LEO spectrum, it must find on the record that Iridium is using its

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[14] See NRM Report, Annex 2, § 4.9.

assigned spectrum fully and efficiently.[15] The Commission did not intend to reward inefficient Big LEO operators with access to more spectrum, and the public interest would not be served by revoking spectrum held by one licensee to the benefit of another licensee that is not spectrum constrained. For the past three months, Globalstar has had the opportunity to observe Iridium's use of L-band spectrum in the Middle East region and globally.[16] These observations reveal that the current traffic on Iridium does not justify modification of the Big LEO band assignment. Moreover, the very design of the Iridium system appears to preclude the type of efficient and effective use of the spectrum that the Commission has come to demand of its licensees.

A. 5.15 MHz Is Sufficient to Sustain Iridium's U.S. Requirements Well into the Future.

Based on information provided by Iridium in descriptions of its system filed with the Commission and during the NRM, Iridium should be able to serve more than half a million subscribers in the Continental United States in the 5.15 MHz currently assigned for Big LEO TDMA systems. (See Tech. App., § 4.1.) Although

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[15] See Big LEO Rules Order, 9 FCC Rcd at 5961 (indicating that system loading and system efficiency are factors to be considered in reviewing spectrum assignments among Big LEO systems).

[16] In April 2003, Iridium requested Special Temporary Authority for additional L-band spectrum to support U.S. forces in the Middle East. See Application File No. SAT-MSC-20030414-00066. Pursuant to this and subsequent STA requests, Iridium for several weeks was using Globalstar's Channels 8 and 9. Globalstar monitored the impact of Iridium transmissions on its service, and so, has access to substantial information on Iridium operations.

Globalstar is not aware of any published subscriber tallies for Iridium,[17] based on MSS subscribers generally, this subscriber level for the Iridium system has certainly not been reached, or even approached. If Iridium indeed needs more spectrum to serve its relatively small subscriber base, then its system design and operation are seriously flawed and inefficient indeed.

B. The Iridium System Uses Spectrum Inefficiently.

Iridium's ability to achieve the capacity available in 5.15 MHz appears to be seriously hampered by design and spectrum usage decisions that have not yet been adjusted to support Iridium's alleged needs. As explained in more detail in the Technical Appendix (§ 4.2), Iridium appears to have recently changed its stated frequency reuse factor from 5 to 8. This has the effect of reducing the efficiency of the system because the same frequency can only be reused at greater distances on the surface of the earth. Also, Iridium admits that it devotes spectrum resources to system overhead, beam-to-beam frequency restrictions and reserve capacity. These spectrum holdbacks cut in half its claimed spectrum efficiency.

The conclusion we draw is that Iridium is utilizing only a fraction of its available capacity to provide service -- on the order of 11% (somewhat higher during busy hours) of the capacity stated in the NRM. At this rate, Iridium could easily claim to need the entire L-band, but would support far fewer subscribers than the

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[17] Iridium is a privately-held company and has no legal obligation to file significant data in public reports. Iridium has not included any data whatsoever in its filings in IB Docket No. 01-185 or elsewhere before the Commission.

current Globalstar system. This is obviously an inefficient use of the L-band capacity, and Iridium should be admonished to improve its spectrum usage before seeking more spectrum.[18] Awarding more spectrum on an exclusive basis to Iridium in these circumstances is contrary to the public interest.

C. Even With More Spectrum, Iridium Cannot Provide ATC in the Big LEO L-Band.

Through its petition for rulemaking,[19] Iridium has sought additional spectrum so that it, like Globalstar, could offer ATC in its assigned MSS spectrum.[20] However, Iridium technically cannot provide ATC in L-band with 5.15 MHz or 10 MHz. Accordingly, Iridium's ATC issues cannot be a basis for a decision modifying the Big LEO band plan.

As the Commission pointed out in the ATC Order, Iridium has never submitted any information on how it could offer ATC within the Big LEO L-band with its bidirectional technology.[21] Iridium has never made such a showing

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[18] The Commission asked (NPRM, ¶ 268) whether the Iridium system technology can be improved and whether Iridium could share spectrum with Globalstar. The Technical Appendix (§ 5) explains that, when properly coordinated, Globalstar can share with another CDMA system. Globalstar may be able to share with the Iridium TDMA system but requires disclosure of certain information to analyze that issue, as explained in the Technical Appendix.

[19] Iridium Satellite LLC, Petition for Rulemaking (filed July 26, 2002).

[20] See, e.g., Iridium Satellite LLC, Ex Parte Notice, IB Dkt. No. 01-185 (filed Dec. 20, 2002).

[21] See ATC Report and Order, 18 FCC Rcd at 2056-57.

because, as discussed below, it is not technically feasible for Iridium to offer ATC in the Big LEO L-band, even if Iridium had access to additional L-band spectrum.[22]

Iridium operates with both return and forward links in the same spectrum band. Iridium does not use S-band for MSS, and so, under the existing ATC rules, Iridium could not use S-band for ATC.[23] As discussed in the Technical Appendix (§ 6), Iridium would have to suppress return link (mobile-to-base station) emissions from ATC terminals at unreasonable limits in order avoid overwhelming the forward link (base station-to-mobile) receivers in the same ATC terminals. The only feasible method for Iridium to offer ATC is to use spectrum with sufficient separation from L-band for the ATC terminal receiver. Accordingly, until Iridium sets forth a feasible plan for how it intends to provide ATC, Iridium's theoretical ATC needs are not relevant to the Big LEO band plan, and the Commission cannot rely on Iridium's purported need for spectrum for ATC to justify any redivision of Big LEO MSS spectrum between TDMA and CDMA systems.

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[22] Iridium was built so as not to use the 2.4 GHz band for downlinks because of the perceived interference issues from Part 18 equipment. See infra § IV.A. The NRM considered Part 18 equipment, such as microwave ovens, as potential interferors for Big LEO MSS in urban areas, and recommended that MSS systems use terrestrial mode transmissions in urban areas. NRM Report, Annex 2, § 4.9. Iridium's decision to use the secondary L-band downlink rather than S-band should have improved its ability to serve to urban areas without ATC.

[23] See ATC Report and Order, 18 FCC Rcd at 2012.

III. THE COMMISSION SHOULD NOT REALLOCATE ANY OF THE 1.6/2.4 GHZ MSS SPECTRUM TO ANOTHER SERVICE.

Globalstar urges the Commission not to reallocate any 1.6/2.4 GHz spectrum for another service.[24] (See NPRM, ¶ 272.) All the available spectrum is needed to provide MSS in the United States. Moreover, the harm from reallocating more spectrum away from valuable MSS services outweighs any benefit that could be obtained from taking narrow segments from this already limited MSS allocation.

A. There Is No Excess Allocation of MSS Spectrum.

In the United States, three separate spectrum bands are allocated for MSS. At L-band, the Commission has licensed MSV (formerly, AMSC, Motient) for 34 MHz of spectrum both on the uplink (1626.5-1660.5 MHz) and downlink (1525-1559 MHz).[25] MSV is required to coordinate use of the band with four non-U.S. systems. There are currently four licensees for MSS at 2 GHz (2000-2020/2180-2200 MHz),[26] while Globalstar and Iridium use the 1610-1626.5/2483.5-2500 MHz bands.

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[24] The Commission also seeks comment on assigning Big LEO spectrum to another MSS system or a government satellite system. (NPRM, ¶ 271.) Globalstar has no objection to sharing spectrum with another commercial or government CDMA-based MSS system. However, any such system should be required to share spectrum, and, depending on its sharing capability, launch of any such system may require reconsideration of any changes to the Big LEO band plan adopted herein.

[25] See Establishing Rules and Policies for Use of Spectrum for Mobile Satellite Services in the Upper and Lower L-Band, 17 FCC Rcd 2703 (2002); Amendment of Parts 2, 22 and 25 of the Commission's Rules to Allocate Spectrum for and to Establish Other Rules and Policies Pertaining to the Use of Radio Frequencies in a Land Mobile Satellite Service, 4 FCC Rcd 6041 (1989).

[26] See Public Notice, Report No. SAT-00135, DA 03-386 (Feb. 10, 2003) (announcing that Celsat America, Inc., Iridium LLC, and ICO Services Limited had (continued...)

There have always been multiple applicants for MSS spectrum; yet, the Commission has allocated 70 MHz of globally-harmonized MSS spectrum to other services. In 1994, the Commission allocated 10 MHz (1980-1990 MHz) of international MSS uplink at 2 GHz to PCS.[27] Despite its success at seeking expanded 2 GHz MSS allocations at the 1997 World Radiocommunication Conference to replace the 10 MHz assigned to PCS,[28] the Commission recently reallocated 30 MHz of MSS spectrum at 2 GHz to terrestrial services, including 20 MHz of globally-harmonized spectrum.[29] And, previously, in the same proceeding, the Commission declined to allocate 40 MHz of internationally-allocated MSS spectrum (2500-2520/2670-2690 MHz) to MSS in the United States.[30]

(...continued)

met first 2 GHz MSS implementation milestone); The Boeing Company, DA 03-2973 (released June 24, 2003) (finding that Boeing met the first 2 GHz MSS implementation milestone).

[27] Amendment of the Commission's Rules to Establish New Personal Communications Services, 9 FCC Rcd 4957, ¶ 97 (1994).

[28] Amendment of Section 2.106 of the Commission's Rules to Allocate Spectrum at 2 GHz for Use by the Mobile-Satellite Service, 12 FCC Rcd 7388, ¶ 8 (1997) ("2 GHz MSS Allocation Order"), aff'd on recon., 13 FCC Rcd 23949 (1998).

[29] See Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support Introduction of New Advanced Wireless Services, Including Third Generation Wireless Systems, 18 FCC Rcd 2223, 2241 (2003) ("AWS Third Report").

[30] See Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support Introduction of New Advanced Wireless Services, Including Third Generation Wireless Systems, 16 FCC Rcd 596, ¶¶ 70-73 (2001).

When the Commission initially allocated 70 MHz of spectrum for 2 GHz MSS, it recognized that the Radiocommunication Sector of the International Telecommunication Union ("ITU") estimated that up to 206 MHz of additional spectrum would be needed for MSS by the year 2005.[31] The Commission has ensured that this estimate *cannot* be fulfilled in the United States because it has preserved only 143 MHz for MSS (including the L-band spectrum which has *not* been coordinated for use by MSV), the majority of which is occupied by first generation MSS systems. Nevertheless, there has been no lessening in the importance of MSS. MSS is the only service that can provide a relatively low-cost and readily accessible telecommunications infrastructure globally. MSS is the only service that can provide service when terrestrial communications systems are knocked out as a result of natural disasters or terrorist attacks. And as demonstrated during the Iraq War, only MSS can meet the instantaneous communications needs of the military and other users in war zones. Proof that MSS fills these needs is demonstrated by the extensive list of public safety organizations that employ Globalstar and other MSS systems. (See Attachment B.) Currently, there are no other frequency bands under consideration in the United States or ITU to enable MSS to expand service for these critical functions.

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[31] See 2 GHz MSS Allocation Order, 12 FCC Rcd 7394-95

B. Given Globalstar's Spectrum Requirements, the Commission Must Not Reallocate 1.6/2.4 GHz MSS Spectrum to Another Service.

The Commission has asked whether it should allow unlicensed devices to operate in the 2483.5-2500 MHz band or whether it is feasible to reallocate paired segments of the 1.6/2.4 GHz bands to another service. For the reasons discussed above, Globalstar objects to both proposals. The Commission and the parties spent years working out the rules for Big LEO systems to manage the co- and adjacent-channel service interference scenarios. Globalstar has relied on the availability of the current CDMA spectrum to develop services and sign up subscribers for those services. Starting over now with a new band plan would be a disruptive, expensive and time-consuming task. The NPRM does not even attempt to identify any countervailing benefits to the public interest.

The operation of unlicensed devices in the 2483.5-2500 MHz band, which is already used by terrestrial fixed and temporary fixed microwave systems, threatens to cause harmful interference to Globalstar, and most likely to any other operating MSS system. Substantial attention was devoted to interference from Part 18 Industrial Scientific and Medical ("ISM") equipment operating in this band during the Big LEO NRM.[32] Essentially, because such devices, like microwave ovens, primarily operate indoors, they are unlikely to cause significant harmful interference problems to MSS phones. However, as discussed in the Technical

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[32] See NRM Report, § 3.4.9.

Appendix (§ 7), the proliferation of unlicensed devices operating outdoors would cause interference to Globalstar METs, and could reduce the system's quality of service, which affects marketability of MSS.[33]

With respect to other licensed services, given the inherent ability to interfere with Big LEO MSS, any new service would have to be licensed on a non-interference basis to MSS and ATC handsets and satellites and to accept interference from MSS and ATC handsets and satellites.[34] For the reasons stated above, Globalstar believes that the Big LEO bands must be preserved for MSS, and that it is not feasible or in the public interest to attempt to reallocate segments of the spectrum to another service.

IV. THE COMMISSION SHOULD REJECT THE BAND PLAN PROPOSALS SUBMITTED BY IRIDIUM.

In its petition for rulemaking regarding the Big LEO band plan and related pleadings, Iridium suggested certain spectrum assignments for its system and the Globalstar system. Iridium's proposals are simply not feasible. Moreover, Iridium has intentionally ignored or glossed over the Commission's findings and the operational considerations that underlay the original Big LEO band plan.

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[33] See, e.g., Joint Reply Comments of L/Q Licensee, Inc., Globalstar, L.P. and AirTouch Communications, Inc., ET Dkt. No. 98-42 (Aug. 24, 1998).

[34] See AWS Third Report, 18 FCC Rcd at 2247 (noting that licensees of new service would have to protect MSS and ATC operations at 2 GHz).

A. The Commission Should Not Ignore the Technical Information Used to Develop the Current Band Plan.

The NPRM initiates a re-examination of the Big LEO band-sharing plan that was adopted almost ten years ago.[35] In 1994, the Commission stated that it might conduct such a review depending upon certain factual developments.[36] Nevertheless, there are certain facts that were used to develop the original band plan that have not changed and still must guide any review of the band plan. And, Iridium has not identified any factual circumstances that support modifying the band plan.

Ten years ago, the proponents of the Iridium system touted its bidirectional use of the 1.6 GHz band (for both MSS uplinks and downlinks) as the only technical way to use the 1.6/2.4 MSS bands to achieve a successful MSS business.[37] The

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[35] The Commission never sought comments on Iridium's petition for rulemaking prior to proposing to modify the Big LEO spectrum plan. See 47 C.F.R. §§ 1.401-405. The petition itself fails to make a *prima facie* case that Iridium needs additional spectrum as a basis for modifying the current Big LEO band plan. Although the Commission stated that it would re-examine the Big LEO band plan if certain conditions were met, it could not be more obvious from the timing and circumstances that Iridium filed its petition as a means to block Globalstar's development of new ancillary terrestrial services, rather than to fulfill any alleged need for additional capacity.

[36] See Big LEO Rules Order, 9 FCC Rcd at 5960.

[37] "There are serious risks and limitations associated with a CDMA full band interference sharing approach which will have a significant impact on CDMA system capacity and performance. These risks and limitations include:

(i) Substantial ambient noise levels in the S-band from ISM devices (primarily microwave ovens) exceeding the thermal noise of the receivers

(continued...)

Iridium system declined the use of the 2.4 GHz band for MSS downlinks, even though that band was specifically allocated for MSS downlinks. Iridium sought an exclusive segment in the 1.6 GHz band for its TDMA technology.[38] In order to accommodate the Iridium system, the United States also sought and achieved an international secondary allocation in the 1.6 GHz band specifically for Iridium's downlink at the 1992 World Administrative Radio Conference.[39]

The proponents of the Globalstar system and three other CDMA NGSO applicants urged the Commission to authorize only CDMA use of the 1.6 GHz and 2.4 GHz bands so that the two bands could be used by all authorized Big LEO systems on a shared basis.[40] This spectrum-sharing plan offered flexibility in how

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(...continued)

> which will prevent MSS operations in many urban and other populated areas."

Report of Motorola on Band Segmentation Sharing, at 2 (*Executive Summary)*, Report of the MSS Above 1 GHz Negotiated Rulemaking Committee, Att. 2 to Annex 1 (Apr. 6, 1993).

[38] See id. (*Report of Motorola*) at 10-13.

[39] See Amendment of Section 2.106 of the Commission's Rules to Allocate the 1610-1626.5 MHz and the 2483.5-2500 MHz Bands for Use by the Mobile Satellite Service, 9 FCC Rcd 536, 539-40(1994) ("Big LEO Allocation Order"); An Inquiry Relating to Preparation for the International Telecommunication Union World Administrative Radio Conference, 6 FCC Rcd 3900, 3939 (1991).

[40] "[T]he Full Band Interference Sharing approach will best serve the public interest because it maximizes multiple entry, promotes competition, and facilitates . . . domestic and international coordination. Most importantly, the Full Band Interference Sharing approach provides for efficient use of spectrum." Final Report of the Majority of the Active Participants of Informal Working Group 1, at xiii,

(continued...)

the spectrum is used, supported multiple entry and ensured that the spectrum would not lie fallow.

Actual or potential multiple entry was critical to the Commission's band plan decision.[41] The Commission was committed to finding opportunities for multiple systems in the Big LEO bands, if technically feasible. Had one system required all the spectrum simply for its own operations, it is clear that the Commission would not have adopted the current Big LEO technical requirements and band plan.

Ultimately, the Commission decided that Iridium's freedom to choose a technical design "to meet the particular needs of [its] customer base" outweighed the benefits of authorizing all systems to use the same spectrum through CDMA sharing.[42] That decision, however, required the Commission to slice off a segment of the 1.6 GHz band for exclusive use by a TDMA system to ensure opportunities for multiple entry in the balance of the band. Indeed, the Commission sliced off the most desirable portion for Motorola's Iridium system, the portion that is relatively free from the burden of protecting GNSS and RAS. Since the other Big LEO applicants also needed spectrum assignments in the 1.6 GHz band, the Commission

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(...continued)

Report of the MSS Above 1 GHz Negotiated Rulemaking Committee, Att. 1 to Annex 1 (Apr. 6, 1993).

[41] See Amendment of the Commission's Rules to Establish Rules and Policies Pertaining to a Mobile Satellite Service in the 1610-1626.5 MHz/2483.5-2500 MHz Frequency Bands, Notice of Proposed Rulemaking, 9 FCC Rcd 1094, 1102 (1994).

[42] See id. at 1100-01.

authorized Iridium to use approximately one-third of the band, and authorized the four CDMA Big LEO applicants to use the remaining two-thirds on a shared basis, plus the entire 2.4 GHz band, which was needed for the CDMA systems' downlinks.[43] The result was the current assignment in which Iridium has exclusive spectrum at 1.6 GHz, and Globalstar operates in a segment of the 1.6 GHz band and the 2.4 GHz band that were designated for spectrum-sharing.

Despite Iridium's dire warnings during the NRM about the perils of providing MSS downlinks at 2.4 GHz, the Globalstar system was successfully constructed and launched using exactly that technology and currently serves over 93,000 subscribers globally. Globalstar uses its flexible design to develop products to meet the needs of a variety of niche markets, some of which would be otherwise underserved. The Commission's decision to permit MSS providers to offer ATC creates an opportunity to target additional niche markets with MSS and ATC services. GLP has identified a number of markets, including public safety and homeland security, that are potential users of combinations of MSS and ATC services.[44]

The Commission cannot undo the decisions that were made 10 years ago for the current Big LEO systems by changing the band plan. If Iridium is not satisfied with its system design (because of its inefficiencies and inability to offer ATC), the

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[43] See Big LEO Rules Order, 9 FCC Rcd at 5854-56.

[44] See Reply Comments of Globalstar, L.P., and L/Q Licensee, Inc., IB Dkt. No. 01-185, at 3-6 (Nov. 13, 2001).

Commission cannot solve Iridium's problems by assigning Iridium more spectrum at L-band.

Indeed, if there are revisions to the band plan, the Commission is likely to reopen controversies that have been resolved ten years ago within the current band plan. For example, Iridium cannot protect RAS sites from interference from its secondary downlink through the exclusion zone methodology. Rather, the ITU has set the maximum acceptable level of interference into the RAS band for MSS downlinks at a spectral PFD ("SPFD") of –238 dBW/m^{-2}/Hz^{-1} (ITU-R RA 769-1). According to the European Science Foundation Committee on Radio Astronomy Frequencies, "[e]ven this [level] represents a significant concession by radioastronomers to satellite-enabled industries as current state-of-the-art [instrument] sensitivities would imply that these should be several orders of magnitude more stringent."[45]

"[T]he small amount of power that leaks from an Iridium satellite transmitter outside of its assigned frequency band of 1621.35-1626.5 MHz is strong enough to drown out the faint cosmic emissions studied by radio astronomers."[46] Consequently, Iridium has agreed to a schedule to meet the ITU standard in the 1610.6-1613.8 MHz band for the Arecibo Radio Astronomy Observatory in Puerto Rico. But, the agreement with Arecibo states that Iridium's average SPFD (when

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[45] ESF Press Release, "Radio Astronomers Agree to 6-Year Frequency 'Time Share' with Iridium LLC," available at http://www.astron.nl/craf/esfpres2.

[46] Id.

lightly loaded) is anticipated to be –223 dBW/m^{-2}/Hz^{-1}, and Iridium must meet the ITU limit during specified times of RAS observations.[47] This agreement was established with Iridium's operations restricted to 1621.35-1626.5 MHz in the U.S., including Puerto Rico. Given Iridium's average SPFD, it is not clear that it can protect any RAS site with operations below 1621.35 MHz.[48]

B. Iridium's Band Proposals Are Contrary to the Public Interest.

As noted above, the impetus for Iridium's petition for rulemaking was not the Commission's dictum in the Big LEO Report and Order that it might one day be appropriate to redistribute 3.1 MHz of L-band spectrum. Rather, Iridium realized that its technology does not provide much flexibility, particularly with respect to its ability to accommodate the addition of ATC.[49] Iridium filed comments in IB Docket No. 01-185 recommending that the Commission not grant ATC authority to any

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[47] See "Coordination Agreement Regarding the Operation of the Iridium® System and the Arecibo Radio Astronomy Observatory," available at http://www.naic.edu/~rfiuser/smarg-iridium. The Commission has elevated the RAS allocation to primary in L-band. See Big LEO Allocation Order, 9 FCC Rcd at 549.

[48] The NRM working group on interservice sharing recommended that there should be a guardband of at least 2.2 MHz between the RAS band edge at 1613.8 MHz and operation of MSS secondary downlinks in the L-band. NRM Report, Annex 2, § 2.7. Iridium's request to operate down to 1615.5 MHz would be inconsistent with this recommendation and the analysis the led to it.

[49] See, e.g., Iridium Satellite LLC, Ex Parte Notice, IB Dkt. No. 01-185 (filed Dec. 20, 2002).

MSS licensee.[50] And, it claimed that even with additional spectrum, it would be difficult to provide ATC due to its choice of technologies.[51] In view of these statements, Iridium's claim to require more spectrum is not credible.

In its petition for rulemaking to reconsider the Big LEO band plan, Iridium provided no concrete information on why it needs additional spectrum at this time. Despite that failing, Iridium has proposed that it should have exclusive access to an additional 5.85 MHz of spectrum (down to 1615.5 MHz), not just the 3.1 MHz that the Commission stated would be considered, leaving Iridium with 11 MHz and Globalstar with only 5.5 MHz in L-band.[52] In short, Iridium's motivation for seeking re-examination of the Big LEO band plan appears designed to block its principal competitor from developing new ATC services and to hamstring Globalstar's expanding subscribership and services, rather than any demonstrated need for spectrum to support its subscribers.

If the Commission finds that the record supports reconfiguration of the Big LEO band plan (which it patently does not at this date), the Commission must act consistently with the facts in relation to the original plan (i.e., no more than 3.1

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[50] See Comments of Iridium Satellite LLC, IB Dkt. No. 01-185, at 5-8 (filed Oct. 22, 2001) (recommending creation of a secondary terrestrial service in the MSS bands and auction of licenses for same to any interested party).

[51] See Ex Parte Notice of Iridium Satellite LLC, IB Dkt. No. 01-185, at 2 (filed Oct. 3, 2002).

[52] If Iridium is capable of operating below 1616 MHz, then it is in violation of its FCC licenses. See Motorola Satellite Services, Inc., 10 FCC Rcd 2268, ¶ 24 (Int'l Bur. 1995); U.S. LEO Services, Inc., 11 FCC Rcd 20474, ¶ 17 (Int'l Bur. 1996).

MHz should be at issue) and the demonstrated needs of the operational Big LEO systems. Globalstar has developed a substantial market for its services, the continuing vitality of which depends, in large part, upon Globalstar's having access to 11.35 MHz of L-band spectrum. Iridium's proposals, if effectuated, would hamstring deployment of the products and services that Globalstar has developed (which Iridium, incidentally, cannot substitute in that spectrum) contrary to the public interest.

There is another reason why Iridium's Big LEO spectrum assignment should not be increased at this time: Iridium currently has MSS spectrum at 2 GHz. In July 2001, the Commission granted the applications of both GLP and Iridium for access to MSS spectrum at 2 GHz.[53] On January 30, 2003, the International Bureau issued an order canceling GLP's 2 GHz MSS licenses.[54] Iridium, however, still holds its 2 GHz MSS license.[55] As a result of these actions, Iridium has access to 10 MHz of spectrum at 2 GHz for its next generation system,[56] and Iridium can

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[53] See Iridium LLC, 16 FCC Rcd 13778 (Int'l Bur. 2001); Globalstar, L.P., 16 FCC Rcd 13739 (Int'l Bur./OET 2001).

[54] Globalstar, L.P., 18 FCC Rcd 1249 (Int'l Bur. 2003). GLP has filed an Emergency Application for Review and Request for Stay of this decision, which remain pending.

[55] Public Notice, Report No. SAT-00135, DA 03-386 (Feb. 10, 2003) (identifying Iridium LLC as having met first implementation milestone for 2 GHz MSS system).

[56] See Iridium 2 GHz LLC, DA 03-2075 (released June 24, 2003) (awarding Iridium 10 MHz of 2 GHz MSS spectrum).

access the remaining 30 MHz of 2 GHz MSS spectrum on a non-interference basis as to other operational systems.[57] Meanwhile, the Globalstar system currently has access only to the 1.6/2.4 GHz MSS spectrum.

The 2 GHz MSS spectrum has always been considered expansion spectrum for the Big LEO systems. And, Iridium can provide ATC in its 2 GHz MSS spectrum assignment. If Iridium needs additional spectrum for its existing services, and spectrum for ATC, it can fulfill those needs through its access to the 2 GHz MSS spectrum.

V. THE COMMISSION MUST PROTECT GLOBALSTAR'S RIGHTS TO OPERATE IN THE EXISTING CDMA SPECTRUM.

As the Commission has already recognized for Big LEO systems, any modification to LQL's and GUSA's existing rights to operate in their assigned spectrum must comply with Section 316 of the Communications Act of 1934, as amended.[58] LQL's and GUSA's licenses have been issued under the existing rules and policies for Big LEO systems, and the Commission "cannot, merely by invoking its rulemaking authority, avoid the adjudicatory procedures required for granting and modifying *individual* licenses."[59]

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[57] See The Establishment of Policies and Service Rules for the Mobile Satellite Service in the 2 GHz Band, 15 FCC Rcd 16127, 16139-40 (2000).

[58] 47 U.S.C. § 316; see Iridium Constellation, LLC and Iridium US LP, Order to Show Cause, ¶ 1 (Int'l Bur. released May 16, 2003).

[59] Committee for Effective Cellular Rules v. FCC, 53 F.3d 1309, 1319 (D.C. Cir. 1995).

Specifically, Section 316 requires that the Commission notify the licensee in writing of any proposed changes and provide an opportunity for it to protest the specific modifications.[60] When the Commission proposes to modify a license, the burden of introduction of evidence and the burden of proof in any hearing proceeding rests with the Commission.[61] These procedures have not yet been invoked for either LQL or GUSA.

The Commission has, in fact, already prejudiced any such protest proceeding by suggesting in the NPRM (¶ 266) that "a rebalancing of the Big LEO band will serve the public interest." The Commission has neither provided nor received evidence on the factors which it indicated were relevant to this issue. Indeed, the Commission stated that the Iridium petition for rulemaking did not provide the necessary facts for such a decision. Pursuant to Section 316, the Commission has the burden of proof if it decides to propose modifications to LQL's and GUSA's licenses, and, to have reached even a tentative conclusion on the issue *without any evidence*, is contrary to law.

Moreover, the Commission suggests in the NPRM (¶ 272) that it might be appropriate to limit the frequencies available to Big LEO MSS and take spectrum away from Big LEO systems for another service. The Commission offered no rationale for limiting Big LEO systems in this way other than vague suggestions of

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[60] 47 U.S.C. § 316(a).

[61] 47 U.S.C. § 316(b).

"changing traffic patterns and consumer demands." (NPRM, ¶ 261.) If the Commission adopts such a standard that would modify the Big LEO band plan to the detriment of LQL and GUSA, that standard must only be applied at some future date, and the criteria triggering the change in the band plan must be elucidated in advance.[62]

The Commission never established a standard for limiting access by MSS systems to the Big LEO spectrum in 1994, such as traffic patterns and consumer demand. There were milestones for construction, launch and operation of the systems, but no traffic-based standard. Indeed, the one standard that it proposed for taking spectrum from CDMA licensees was specifically not adopted, that is, the proposed redistribution of 3.1 MHz of the Big LEO spectrum if only one CDMA and one TDMA system became operational.[63] LQL and GUSA met all relevant milestones, are using the entire CDMA spectrum assignments, and have developed equipment and services in reliance on the availability of the CDMA spectrum. They were not required to meet any specific traffic, demand or other standard on spectrum usage; if the Commission had adopted such a standard, as it has for other services, the business plan for going forward on these systems would have been different. Therefore, any modification to the Big LEO band plan which takes

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[62] Taking away spectrum from LQL's and GUSA's licenses may effect a revocation even if not all frequencies are reclaimed. The Commission would, therefore, be required to meet the notice and hearing requirements set forth in Section 312 of the Act. 47 U.S.C. § 312.

[63] See Big LEO Rules Order, 9 FCC Rcd at 5959-60.

spectrum away from LQL's and GUSA's licenses based on some newly announced traffic standard would unfairly penalize these companies for not meeting a standard which the Commission has not even articulated.

It is well settled that "[t]raditional concepts of due process incorporated into administrative law preclude an agency from penalizing a private party for violating a rule without first providing adequate notice of the substance of the rule."[64] The Commission never suggested in 1994 that it would take spectrum away from Big LEO systems for "traffic" or "demand" patterns, and, therefore, it cannot do so now except on a prospective basis based on some clearly articulated policy that LQL and GUSA have a realistic opportunity to meet.

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[64] Satellite Broadcasting Co. v. FCC, 824 F.2d 1, 3 (D.C. Cir. 1987); see also, e.g., Eastern Carolina Broadcasting Co. v. FCC, 762 F.2d 95, 101 (D.C. Cir. 1985); Trinity Broadcasting of Florida, Inc. v. FCC, 211 F.3d 618, 632 (D.C. Cir. 2000).

VI. CONCLUSION

For the reasons set forth above, the existing Big LEO band plan does not need to be modified, and all the spectrum at 1.6/2.4 GHz should be retained for MSS.

Respectfully submitted,

L/Q LICENSEE, INC.
GLOBALSTAR, L.P.
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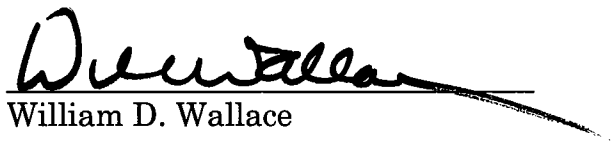

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TECHNICAL APPENDIX

July 9, 2003

GLOBALSTAR
TECHNICAL APPENDIX
IB Docket No. 02-364

1. Globlastar Spectrum Requirements

The FCC, in Paragraph 269 of the NPRM, asks for comment on how Globalstar is using its assigned spectrum and what Globalstar's projected spectrum needs are in the future. These issues are addressed in this section.

1.1 Globalstar's Projected MSS Spectrum Needs

Globalstar's seven-year business plan requires the use of 13 forward link (i.e., satellite-to-user links) channels and 9 return link (i.e., user-to-satellite links) channels in the United States to serve the satellite based traffic projected for the next seven years. Specifically, the projected traffic consists of a mix of at least three very different categories of traffic: (a) voice users who are moving at relatively slow speeds; (b) aeronautical users who use higher data rates and move very fast; and (c) simplex telemetry users who use a different modulation and spreading scheme than the others.

The complexity of this traffic mix imposes constraints on the assignment of frequencies, over and above what was called for in Globalstar's original business plan, which was primarily voice based, low speed users. Globalstar needs to allocate two separate channels to aeronautical users, since they very rapidly cut across multiple gateways and satellites compared to other users. Globalstar's aeronautical terminals have been built to meet FAA and RTCA standards, which require use of return link frequencies above 1616 MHz.[1] In addition, on the return link, Globalstar needs to allocate at least one 2.5 MHz channel or 2 channels of 1.23 MHz each to simplex telemetry users to provide these terminals with a commercially-acceptable quality of service without interference from voice users.

[1] RTCA, Inc., "Minimum Operational Performance Standards for Avionics Supporting Next Generation Satellite Systems (NGSS)," RTCA/DO-262 (Dec. 14, 2000).

1.2 Globalstar's ATC Requirements

As shown in Globalstar's technical analysis in its ex parte presentation to the FCC of June 27, 2002, in IB Docket No. 01-185, in order to support a projected 3.9 million subscribers in the Continental U.S. (CONUS) using ATC mode, Globalstar would require one channel at L-band and one channel at S-band. With an assumed 30 mE per subscriber traffic intensity, this translates into 29,400 simultaneous voice circuits in any one L-band beam, with 4 beams approximately covering CONUS. Since ATC is meant to cover urban areas, this projected number of subscribers in CONUS is a very small fraction of the traffic demand that is anticipated. Thus Globalstar needs to assign at least one channel in the Big LEO S-band and one channel in the Big LEO L-band in order to meet its projected ATC requirements.

1.3 Total Globalstar Spectrum Requirements

Globalstar projects using at least four L-band channels for voice and data users, and a proportionate number of S-band channels as discussed below. Adding the requirements for MSS service and ATC service given in the paragraphs above, the total Globalstar spectrum requirements in the United States are 13 channels or 16.5 MHz at S- band and 9 channels or 11.35 MHz at L-band (assuming that ATC and MSS do not have large demands in the same geographic area).

2. Impact of GNSS and RAS Protection Requirements

In Paragraph 270 of the NPRM, the FCC asks for comments on whether changes to the Big LEO spectrum sharing would have any effect on GLONASS and radioastronomy services (RAS) in the L-band. Globalstar responds below by pointing out what it is already doing and will continue to need to do to protect these services. In effect the requirement to protect these services reduces the usability of the lower portion of the Big LEO band by Globalstar.

2.1 Protection of GNSS

The Big LEO MSS requirements for protection of the Global Navigation Satellite Service (GNSS) and RAS affect only the lower L-band, which is assigned to CDMA systems, such as Globalstar. The one TDMA system, Iridium, is assigned higher frequencies that are largely unaffected by these requirements.

The European Telecommunications Research Institute (ETSI) established out-of-band emission requirements for MSS terminals, which were also then adopted in most countries around the world, including the United States (47 CFR Section 25.216). These restrictions arise from the need to protect GNSS and can only be fulfilled by filtering the output of user terminals so as to restrict their out-of-band emissions in the band 1574-1605 MHz to –70 dBW/MHz. This stringent requirement can only be achieved by reducing the power of car-kits and fixed users (and sometimes even handsets) operating

in the lowest two channels of Globalstar's return link. The required reduction in power in these channels decreases the quality of the signal at the lower band edge, as the CDMA applicants pointed out during the Big LEO Negotiated Rulemaking. Indeed, the decreased quality of service in the lower channels justifies assigning CDMA systems a larger portion of the 1610-1626.5 MHz band, so that there are channels available to move users away from the affected channels.

2.2 Protection for Radio-Astronomy

The need to protect RAS sites, which take passive observations in the 1610.6 to 1613.8 MHz band, prevents the use of Globalstar channels 1, 2 and 3 in the specified "exclusion zones" within a radius of 160 km around RAS sites during observations. There are also smaller exclusion zones affecting channels 4 and 5. Even ignoring the smaller exclusion zones for channels 4 and 5, in CONUS and Puerto Rico, 10% of the total coverage area effectively has only six channels available out of Globalstar's current assignment of nine return link channels (11.35 MHz).

2.3 Other Global Restrictions

In other parts of the world, Globalstar is even further restricted in channel usage because of GNSS protection requirements, specifically to channels 6 and above in Russia and Italy and channels 5 and above in France. The worldwide (including US) restrictions are also more stringent for aeronautical terminals, which are built to operate only on Globalstar's channel 6 and above.

The coordination with Radio Astronomy requires that when an airborne mobile earth station is within 4.1sqrt (h) km (where h is the aircraft altitude in meters) of a RAS that is making observations, the average emission level in the 1610.6 to 1613.8 MHz band shall not exceed –65 dBW/MHz. Since 1610.6 to 1613.8 MHz falls directly in the lower part of Globalstar's allocated bandwidth for the return link, these lower channels cannot be used for aeronautical services, which are a very important segment of our projected market.

3. GLP's Spectrum Requirements in the Big LEO S-Band

In Paragraph 269 of the NPRM, the FCC asks whether Globalstar needs more spectrum in the S-band downlink than in the L-band uplink, and whether the Commission should pair the uplink and downlink assignments. The answer is that Globalstar does require more downlink spectrum than uplink spectrum.

The asymmetric requirements for bandwidth for Globalstar services (16.5 MHz in the forward link and 11.35 MHz in the return link) arise because of the different technical considerations that determine capacity in the two directions and the differing regulatory restrictions on the two bands. When the Commission adopted the asymmetrical spectrum assignment for CDMA systems, the Globalstar system was designed to provide

approximately equal forward and return link capacity based on the availability of 16.5 MHz on the forward link and 11.35 MHz on the return link. The intuitive reasons for the asymmetric bandwidth requirements are explained below.

Forward link capacity in Globalstar is mainly driven by the PFD restriction at S-band, which limits how much power can be used per MHz, translating into a limit on power per CDMA channel, which limits the number of users per channel. In effect, forward link bandwidth is used less efficiently than it would be if the PFD restriction were not present or were less stringent.

Return link capacity, however, is determined by bandwidth available and user terminal output power needed to close the link in the presence of other interferers, both self-interference and external sources of interference. The reduction of bandwidth on the return link (relative to the forward link) effectively packs more circuits into each channel on the return link, which in turn increases the MSS terminal EIRP. MSS terminal EIRP is not regulated in the same way that the satellite downlink PFD is regulated, but instead is determined by size, weight and power limitations on mobile terminals, by out-of-band filtering requirements imposed by the need to protect GNSS at the lower end and Iridium at the upper end of the spectrum, and by limits on human exposure to RF radiation. Globalstar has optimized its system capacity for both forward and return links by a complex process that takes into account the impact of all these different restrictions. When a Globalstar satellite is operating within the S-band PFD limit, the number of users per channel on the return link is 1.4 (very close to 16.5/11.35) times the number of users per channel on the forward link, and the user terminal EIRP is within system and regulatory constraints when this capacity is reached. If Globalstar were forced to operate with less S-band spectrum, the capacity of the entire system would be reduced because the PFD limit does not allow putting more users in the remaining S-band channels to make up for the channels taken away.

4. Iridium's Capacity in 5.15 MHz

In paragraph 268 of the NPRM, the FCC has called for technical information on Iridium's current and projected spectrum use. Table 4.1 below shows an estimate of Iridium's system capacity achievable in its assigned 5.15 MHz bandwidth, based on publicly available information about Iridium. However, based on Globalstar observations of Iridium signals in the Middle East in April and May 2003, the actual Iridium spectrum usage is only 9 to 11 % of this estimate, as detailed in Globalstar's letter to the FCC dated May 1, 2003, and reviewed in Section 4.2 below. Iridium, in its May 8 letter to the FCC, disputed Globalstar's calculations based on these observations.[2] A rebuttal to Iridium's capacity statements in its May 8 letter is provided in paragraph 4.2 below. Section 4.3 puts the theoretical and observed data together to estimate actual Iridium usage in its current system.

[2] GLP's May 1, 2003 letter is included as Attachment C, and Iridium's May 8, 2003 response is at Attachment D.

4.1 Estimates of Iridium's Capacity

Based on information from Iridium's 1993 Amendment filed with the FCC, the Iridium system would cover the continental United States (CONUS) with 59 beams and a frequency reuse factor of 5.[3] Using the stated carrier separation of 41.67 kHz and 4 TDMA slots per carrier, Iridium, in theory, can support 2917 simultaneous full-duplex voice circuits in 5.15 MHz in CONUS. Alternatively, using Iridium's own estimate of capacity from the 1993 Big LEO NRM, Iridium should have 2556 full duplex voice circuits in 5.5 MHz, which translates to 2393 full duplex voice circuits in 5.15 MHz assuming a proportional scaling for the reduced bandwidth. Thus, depending on what method is used to calculate Iridium's CONUS theoretical capacity, it is between 2393 and 2917 simultaneous full duplex voice circuits.

Translating the duplex circuit capacity into the number of subscribers that Iridium can serve requires an assumption about how much time each subscriber uses a given circuit during the busy hour, or the traffic intensity. Typical values appropriate for MSS systems range from .003 Erlangs per subscriber to .01 Erlangs per subscriber. As shown in Table 4.1, depending on what traffic intensity is used, and what method of estimating simultaneous call capacity is used, Iridium's subscriber capacity over CONUS ranges from 357,000 to 972,000 subscribers supported in the busy hour.

Table 4.1: Theoretical Iridium Capacity over CONUS (full duplex voice subscribers)

Iridium capacity estimates	
BW available, MHz	5.15
Carrier separation, MHz	0.04
Carriers total	123.59
Full duplex TDMA ckts per carrier	2.00
Full duplex ckts per beam	247.18
Freq. Reuse	5.00
Number of beams per CONUS	59.00
FD users per CONUS	2916.73
Traffic intensity, busy hour Erlangs/sub	0.003
Total # of subs in busy hr	972242.22
Alternate estimate based on NRM	
CONUS capacity in 5.5 MHz	2556.00
CONUS capacity in 5.15 MHz	2393.35
Traffic intensity, busy hour Erlangs/sub	0.003
Total # subs in busy hr	797781.82
Conservative estimate	
Traffic intensity, busy hour Erlangs/sub	0.01
CONUS capacity in 5.15 MHz (NRM)	2393.35
Total # subs/busy hr	357215.74

[3] We note elsewhere that Iridium seems to be using a less efficient reuse factor of 8.

4.2 Iridium's Observed Spectrum Utilization

In its May 8, 2003, response to Globalstar's May 1, 2003, letter, Iridium tries to show that Iridium is using all its available spectrum resources at close to peak capacity, including Globalstar's channels 8 and 9. Iridium challenges Globalstar's conclusions that Iridium is using only 9% of its spectrum resources in channels 8 and 9. The May 8 letter from Iridium provides more information than Iridium has previously provided about its frequency assignment strategies, and this new information explains some of the discrepancies between Globalstar's analysis and Iridium's.

Iridium claims that its calculated use of available spectrum is 64.18%, instead of Globalstar's calculation of 9%. We will attempt to reconcile these two values in this section. Part of the discrepancy between Globalstar's original (May 1) estimate and Iridium's calculations in its May 8 response could be explained by the facts that (a) Iridium now appears to be using a frequency reuse pattern of 8 beams[4] rather than the 5 beam pattern stated in the Big LEO NRM, upon which Globalstar relied originally; and (b) in subsequent measurements made by Globalstar on May 6 and 7, such as those shown in Figure 1 of Globalstar's May 1 letter, an average of two carriers (and a maximum of four carriers) were observed in channel 9 rather than the 1.6 which were observed previously in channel 8 and reported in Globalstar's May 1 letter. The factor of 2/1.6 leads to revised estimates of Iridium's capacity usage of 11.25% (rather than 9%) of the possible spectral resources.

Each of the factors resulting in significant reductions to Iridium's claimed capacity is discussed in more detail below.

The first factor, which is the frequency reuse factor, addresses the issue of how efficiently Iridium is using its spectral allocation at L-band. In an MSS system, as in terrestrial cellular systems, efficiency of spectral use is achieved by a frequency reuse scheme, whereby the same set of frequencies is reused in a region that is sufficiently separated spatially, so that users receiving at exactly the same frequency at exactly the same time do not interfere with each other very much. Typically, a frequency reuse scheme will divide a given region into approximately hexagonal cells, and reuse the same frequencies every K cells. Thus a scheme where K = 5 cells (as proposed by Iridium in the Big LEO NRM) is more efficient than one in which the same frequency can be reused only every 8^{th} cell (as Iridium now seems to be doing). This leads to the conclusion that the original Big LEO NRM estimates of capacity need to be reduced by a factor of 5/8 to account for the more inefficient frequency reuse.

The second reason for the difference in estimates is that even using Iridium's own methodology, the calculated efficiency of 64.18% should actually be only 37.4 %, because the 'maximum call minutes' of 201,600 that Iridium used in this computation should not discount for inefficiencies due to system overhead, beam-to-beam frequency

[4] This is suggested by Iridium's statement on page 2 about 7 sub-bands in Globalstar's channels 8 and 9, or a 333 kHz spacing of sub-bands.

restrictions and reserve capacity. Specifically, if Iridium has already attempted to take these factors into account by going from 60 traffic carriers in 2.5 MHz down to 35 traffic carriers in 2.5 MHz [5] to come up with the supportable 201,600 maximum call minutes, then this already decreased number of carriers available should not be used as the baseline of that analysis, when calculating spectral utilization in the peak busy hour. If the correct 'maximum call minutes' corresponding to 60 traffic carriers is used, the actual efficiency of usage in the peak busy hour drops to 37.4 % (and the efficiency of usage on average drops to 20%, after accounting for the 1.89 peak-to-average factor[6]).

Further, as a minor issue, the number 68,382 minutes per day that is used in Iridium's calculations is not exactly supported by its data in Attachment 2,[7] which shows a number of call minutes that is closer to 64,000 after April 26. This leads to a spectral utilization of 35% in the peak busy hour (and 18.5% on average). Table 4.2 summarizes the impact of these factors that account for the differences in Iridium's analysis and Globalstar's.

Table 4.2: Comparison of revised estimates based on Globalstar and Iridium measurements

Iridium's L-Band Efficiency	Note
100%	As stated in NRM
64%	Iridium May 8 filing p.4 based on 68,382 call minutes average per day
37%	"Overhead channels, beam-to-beam reuse restrictions, and reserve channel capacity" Iridium May 8 filing, p.3 Reduction of 35/60
35%	64000 minutes per day versus 68,382
22%	8 beam re-use pattern instead of 5. Reduction of 5/8
11.25%	Globalstar's revised estimate based upon more recent measurements. Increase of 2/1.6.
9%	Globalstar's original estimate

In conclusion, Iridium's efficiency is at most 22% in the busy hour, not 64% as claimed by Iridium. (The daily average is only 12% efficient, using Iridium's peak-to-average factor of 1.89.)

These values are much closer to Globalstar's revised estimate of 11.25% usage. The remaining discrepancy between Globalstar's and Iridium's analyses could be attributable

[5] Page 3 of Iridium's letter to FCC of May 8.

[6] Page 4 of Iridium's letter to FCC of May 8.

[7] Attachment 2 to Iridium letter of May 8.

to the fact that Iridium's average call minutes of 68,382 per day, used as the basis of its calculations, is not just from Iraq, but a greater region surrounding Iraq, since Iridium's statement of what area these calls represent is vague, at best.

Further corroboration of Globalstar's analysis is provided by Iridium's May 8 letter to the FCC. Referring to the topmost curve in Attachment 4 to Iridium's May 8 letter, the maximum number of connections on a satellite is around 360, even after the addition of channels 8 and 9. This number is only 9.4 % of the maximum number of L-band uplink channels per satellite of 3840 which was given in Table R-1 of Iridium's FCC Minor Amendment, which formed the basis of its capacity estimates in the NRM. Note that this 9.4 % is about the same as Globalstar's May 1 estimate of Iridium's capacity utilization.

4.3 Iridium's Actual Capacity

Putting together the theoretical estimates of Section 4.1 and the 11.25% factor calculated in Section 4.2 leads to an actual Iridium capacity in 5.15 MHz over CONUS of 269 to 328 full duplex voice circuits, which leads to between 40,186 and 109,377 subscribers supported in the busy hour.

5. CDMA-TMDA Spectrum Sharing

The FCC asks in paragraph 268 of the NPRM for information on whether, if Iridium used CDMA technology in a portion of the L-band, there would be sharing opportunities with Globalstar. The answer to this question is a qualified "yes".

As shown by GLP, Odyssey and other CDMA operators in the 1993 Big LEO NRM (see *Report of the MSS Above 1 GHz Negotiated Rulemaking Committee, April 6, 1993)*, multiple CDMA systems can co-exist in the same frequency band, with a reduction in capacity for each system (relative to what would happen in the absence of the other sharing system), but increased overall capacity in the band. The capacity of each individual system decreases because each system appears as interference to the other systems sharing the band. But, the overall capacity can be shown to be higher, because PFD restrictions limit the power that can be transmitted on a per-system basis. In addition, the ITU recognized this sharing capability and recently (in 2000) set forth recommendations for coordination between MSS Networks using CDMA in ITU-R M.1186.

Although Iridium objected to sharing the band during the 1993 Big LEO NRM, the reality is that Globalstar and Iridium have been sharing channels 8 and 9 under Iridium's STA during April and May 2003. Uplink areal EIRP restrictions on both Globalstar and Iridium, similar to the ones described in ITU-R M.1186, would allow each company to use the spectrum without significant harm to the other. Based on extensive analysis and simulations that were done during coordination between Globalstar and Odyssey as part of CDMA sharing, each MSS system agreed to the following uplink areal EIRP restrictions at L-band: the aggregate Mobile Earth Station EIRP, averaged over two

minutes for each MSS system operating co-frequency and co-coverage in the band 1610-1621.35 MHz on opposite polarizations within a circular surface area of 500,000 sq. nmi. would be limited to 10 dBW/MHz.

In addition, if Iridium were to use the same portion of the L-band for its downlink on a secondary basis, then Globalstar would need more information from Iridium about its system, especially its satellite EIRP and L-band transmit antenna sidelobe levels, in order to ensure that Globalstar can tolerate interference into its satellites over the rim of the Earth. Analyses of secondary downlink interference were presented by Globalstar in 1993 in discussions leading to the NRM band-splitting decision, and are still valid if a portion of the current CDMA L-band is used by Iridium for its downlink. Coordination between CDMA and TDMA systems would thus include the discussion of areal EIRP limits and information on satellite EIRP and antenna sidelobe levels.

6. Iridium's Proposal for ATC in L-Band

Iridium proposes to use a portion of the L-band spectrum to provide ATC. However, since Iridium does not have any S-band assignment (unlike Globalstar), it is infeasible for Iridium to provide ATC—even if it were assigned the entire 16.5 MHz available for MSS at L-band. As Table 6.1 shows, a terminal's output power in ATC mode would need to be suppressed by 157 dB in order to prevent it from completely swamping the ATC receiver, assuming that ATC is operating as a GSM service and requires the interference from the transmitter into its collocated receiver to be 10 dB below noise level.

If Iridium were to use CDMA, the filtering requirement is estimated to be lower, because of CDMA's wider bandwidth and greater tolerance to interference (assuming that interference needs to be 6 dB below noise power density), but the filter requirement still needs to be 145 dB. This level of filter suppression is impossible to achieve when the frequency separation is at most a few MHz. For example, a typical fourth order Chebyshev filter, which could be used in a handset, has an attenuation on the order of 16 dB at the stop-band edge, and the filter order grows approximately linearly with the dB value of the attenuation needed. A third order Butterworth filter would also provide about the same stop-band attenuation. As the filter order increases, the size of the filter grows proportionately larger, so that a 145 dB attenuation needs an impractical filter size.

The filtering requirement is not a problem for Globalstar's ATC mode, since the transmit and receive bands are separated by about 900 MHz. Therefore, Iridium's argument that it needs more spectrum at L-band in order to offer ATC is totally invalid. The only way Iridium can offer ATC would be by using some other spectrum that is tens if not hundreds of MHz from the transmit frequencies for terrestrial mode receiver. For example, if the handset includes a third order Butterworth filter which has a 10 MHz bandwidth at L-band, one can suppress the transmit signal by about 144 dB at receive frequencies that are 240 MHz away.

Table 6.1: Estimated filtering requirements for Iridium ATC

Iridium ATC in L-band

Typical EIRP from UT, terrestrial mode, dBW	-4	
Typical receiver noise temp. Ts, K	250	
Typical signal BW, Hz	200000	GSM 200 kHz
Receiver noise in signal BW,dBW	-151.61	
Filtering to suppress GSM Tx signal to 10 dB below noise level, dB	157.6103	
Typical signal BW, Hz	1230000	CDMA 1.23 MHz
Receiver noise in signal BW, dBW	-143.722	
Filtering to suppress CDMA Tx signal to 6 dB below noise level, dB	145.7215	

7. Use of S-band by Unlicensed Devices

In Paragraph 272 of the NPRM, the FCC seeks "comment on allowing unlicensed devices to operate in any returned spectrum" in the 2483.5- 2500 MHz band. As explained in section 1 above, Globalstar's projected traffic demands make it necessary that Globalstar have full access to 13 channels, i.e., 16.5 MHz of spectrum at S-band.

Interference from unlicensed devices will increase even for users in the remaining portion of the Globalstar S-band forward link service frequencies. The FCC does not specify the types of unlicensed devices it would propose to allow in this band. However, the cases of interference caused by microwave ovens and RF lighting devices are discussed below. Even though microwave ovens typically have a center frequency of 2450 MHz, the high power bursts that they transmit causes interference to Globalstar users within some distance of the ovens, just because the noise level in the vicinity of the oven in the 2483.5-2500 MHz band is increased when the oven is on. Even more damaging would be devices such as the RF lighting device that were proposed by Fusion Lighting of Los Gatos, CA, and discussed in comments filed in ET Docket No. 98-42. As stated in Globalstar's technical analysis in response to the proposal by Fusion Lighting, these devices would be more harmful than microwave ovens for the following reasons.

1. *Distinctions from Microwave Ovens.* The RF lighting devices are vastly different from microwave ovens with respect to potential interference to the Globalstar MSS System. This difference stems from several basic facts: (a) RF lighting devices operating in the ISM band emit more microwave energy than do microwave ovens; (b) RF lighting devices will be deployed outdoors, often in elevated locations, and hence do not benefit from similar microwave energy dissipation due to buildings, terrain and foliage; and (c) microwave ovens operate only intermittently, while RF lighting devices operate continuously.

2. *Shielding.* The proposed RF lighting devices use a magnetron, a microwave vacuum tube suitable for generating large amounts of microwave energy, to excite a mixture of sulfur and argon gas to generate light. There is little evidence of shielding or other methods used to prevent the radiation of

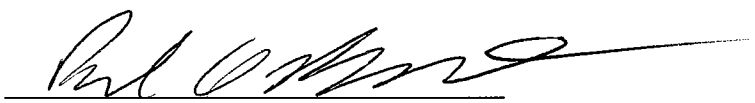
microwave energy from these devices as there is with microwave ovens, hence it is expected that the radiation from these devices will exceed that of microwave ovens. In contrast, microwave ovens are designed to cook whatever is placed inside them and to protect humans from energy leaks. Therefore, microwave ovens are made to keep the energy inside.

In short, as was discussed in the Big LEO NRM, there are good reasons not to permit deployment of unlicensed devices in the 2483.5-2500 MHz band, and, if such devices are permitted, to impose restrictions such as indoor use to mitigate interference into MSS systems.

Engineering Certification

I hereby certify under penalty of perjury that I am the technically qualified person responsible for preparation of the engineering information contained in the foregoing "Technical Appendix"; that I am familiar with the relevant sections of the FCC's Rules, the proposals set forth in the "Notice of Proposed Rulemaking" in IB Docket No. 02-364, and the information contained in the foregoing Technical Appendix; and that information in the Technical Appendix is true and correct to the best of my knowledge and belief.

Signed this 9rd day of July 2003.

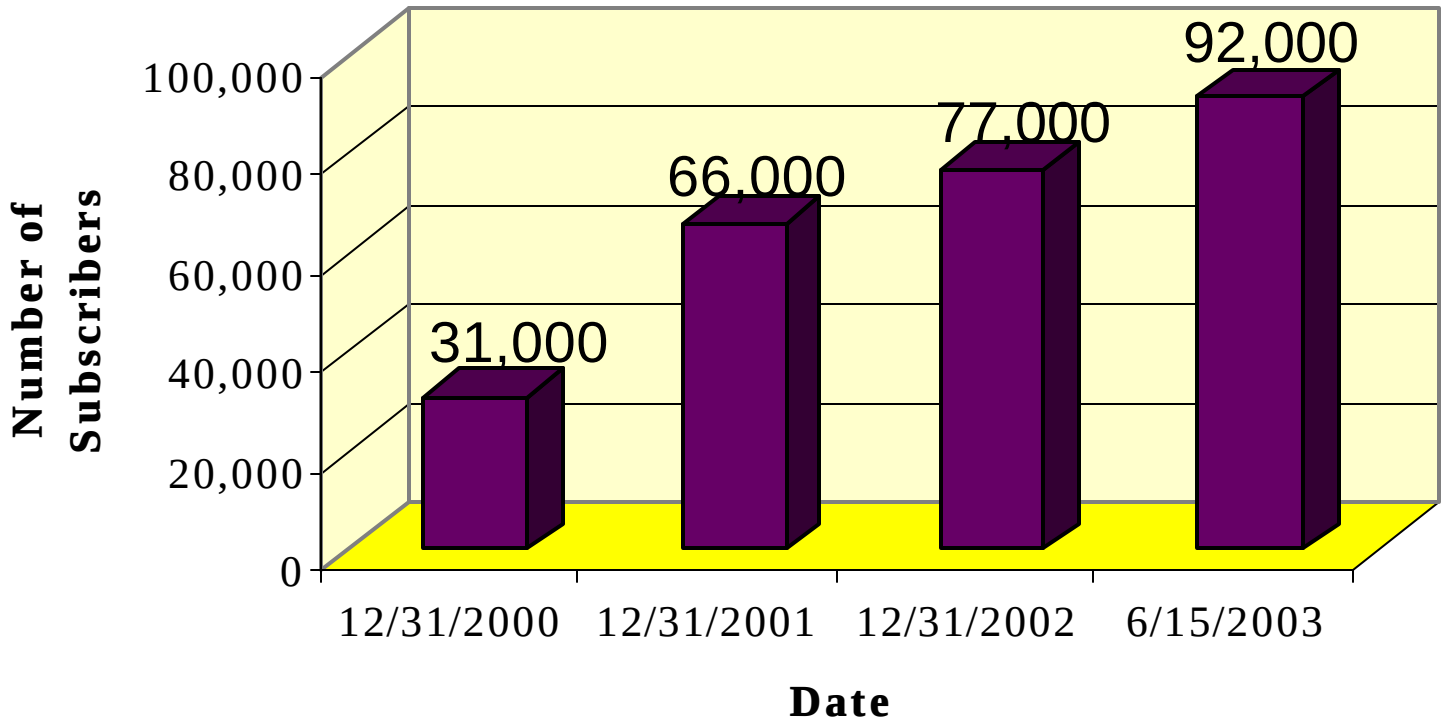


Paul A. Monte

Director, Systems & Regulatory Engineering
Globalstar L. P.

ATTACHMENT A

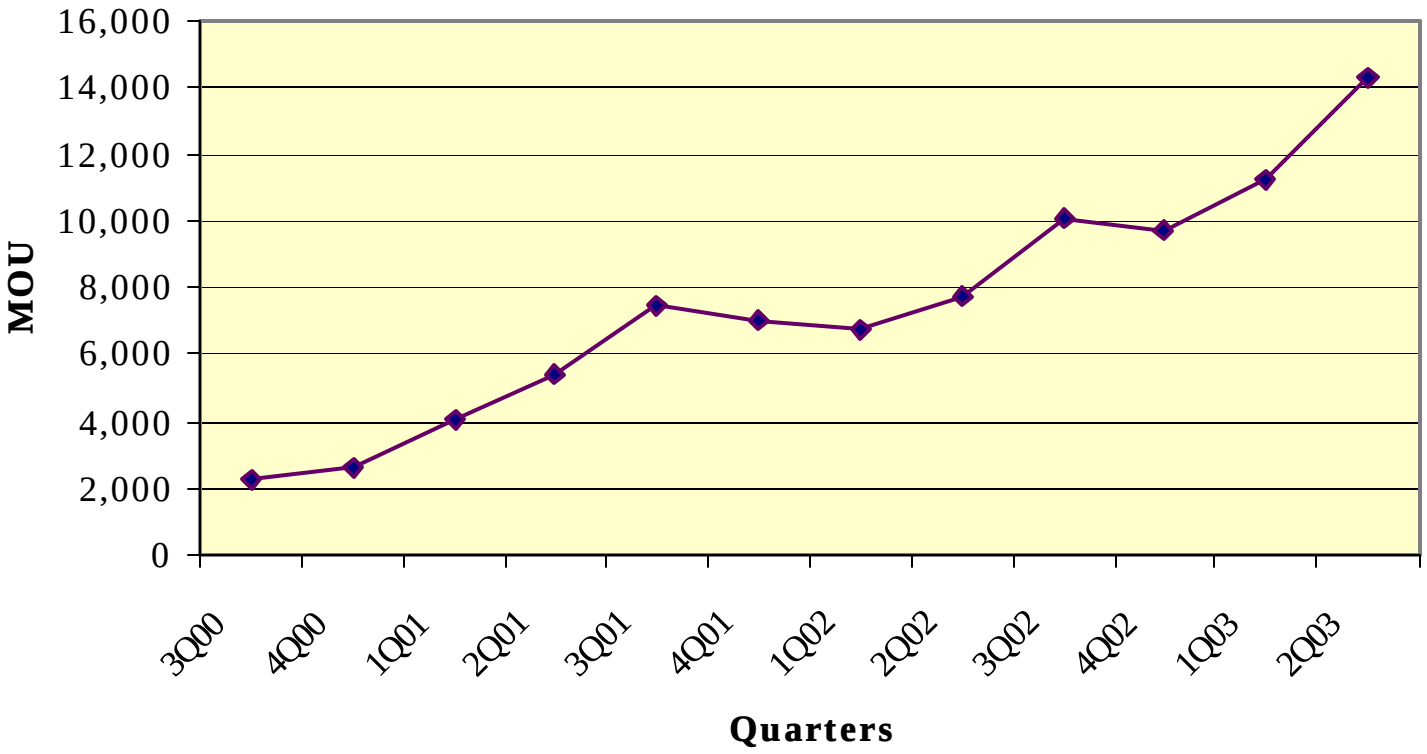
Total Commercial Subscribers



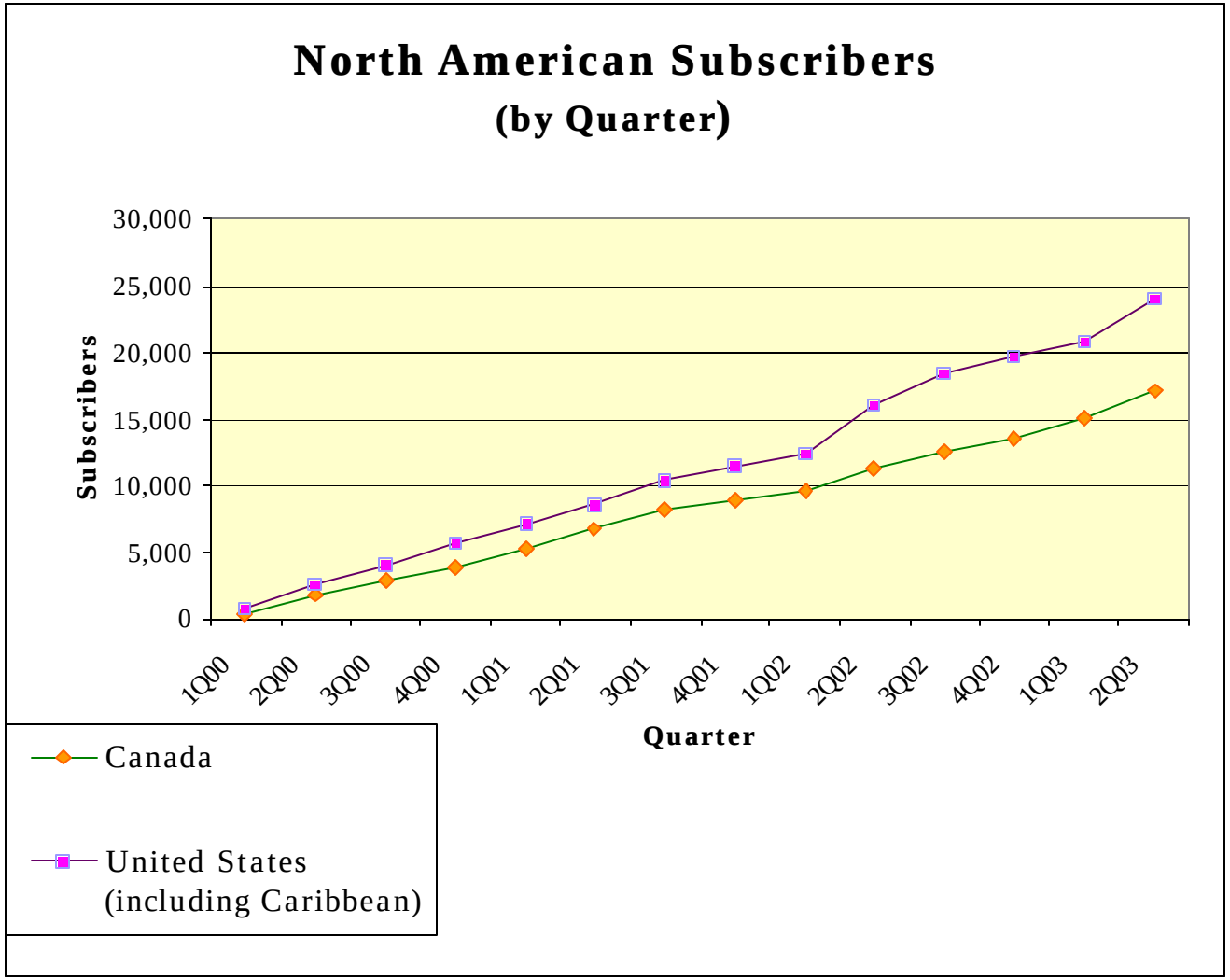
Globalstar

Total System Usage

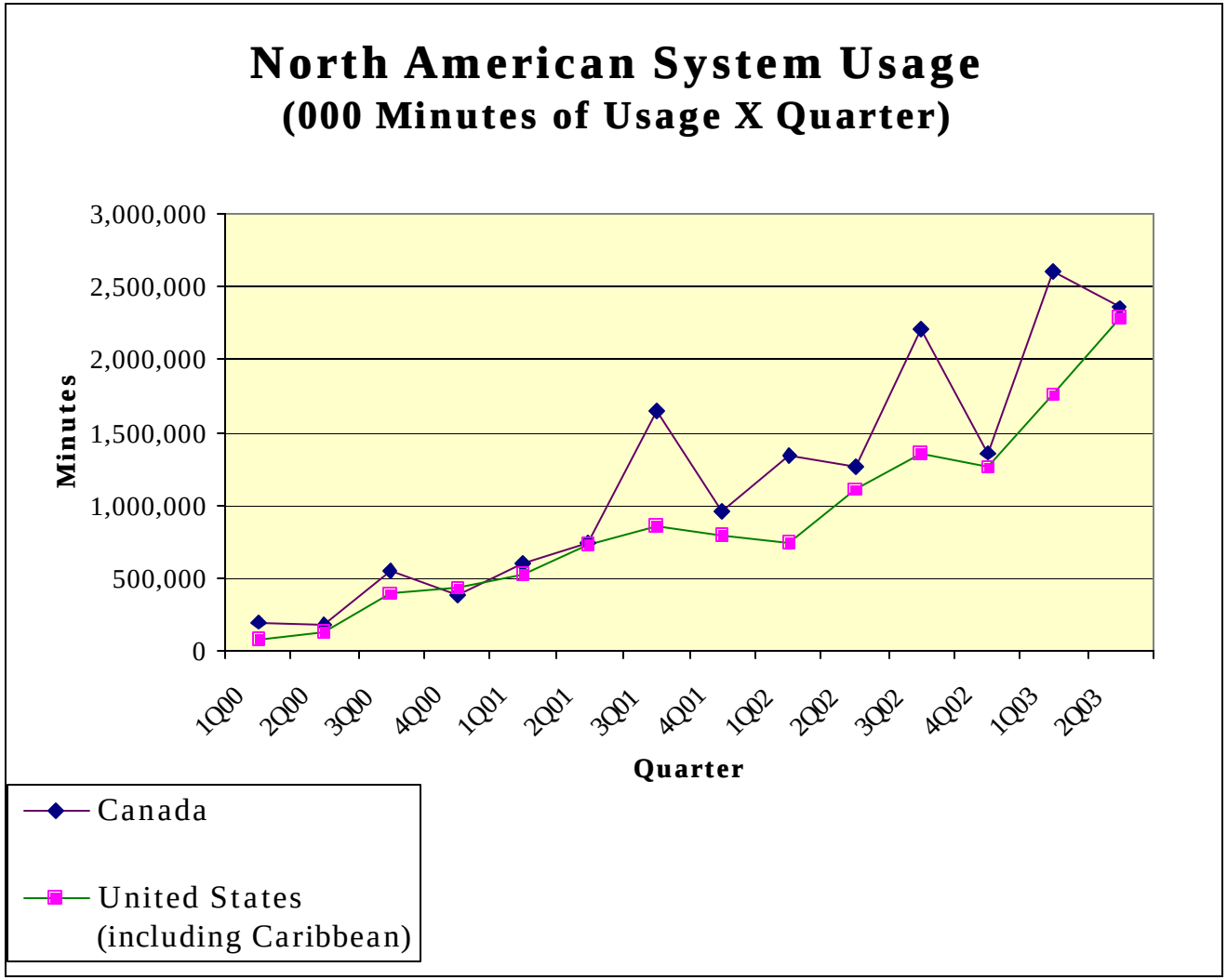
(000 Minutes of Usage) x Quarter



Globalstar


North American Subscribers
(by Quarter)
30,000
25,000
20,000
15,000
10,000
5,000
0
Subscribers
1Q00
2Q00
3Q00
4Q00
1Q01
2Q01
3Q01
4Q01
1Q02
2Q02
3Q02
4Q02
1Q03
2Q03
Quarter
Canada
United States
(including Caribbean)

Globalstar


North American System Usage
(000 Minutes of Usage X Quarter)
Minutes
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
1Q00
2Q00
3Q00
4Q00
1Q01
2Q01
3Q01
4Q01
1Q02
2Q02
3Q02
4Q02
1Q03
2Q03
Quarter
Canada
United States
(including Caribbean)

Globalstar

ATTACHMENT B

Domestic & International Public Safety and Other Governmental Customers of Globalstar	
Altadena Mountain Rescue Team	American military troops stationed in Egypt
Brazilian Air Force, Police & Fire Departments	Brazilian Tax Authority
Brazilian Network of hydrometereology measurement stations	Canadian Rangers
Emergency Services Team-1 Environmental Services Inc. (Chemical emergency response)	ENEL (Italian National Power Company)
Italian Navy	Kalbarry Volunteer State Emergency (Australia)
Kativ Regional Government (rural Canada)	Medical and humanitarian programs in Afghanistan
National Aeronautics and Space Administration	Northern Canadian Communities- Air Ambulance operators.
Nunavik Regional Government (rural Canada)	Office of Homeland Security
Orange County, California	Petrobras (Brazilian National Petroleum Company)
Protection Branch of the British Columbia Ministry of Forests	Raytheon (First Responder Command and Communication Vehicle)
Russia's Ministry of Civil Defense, Extraordinary Situations and Natural Disasters	San Dimas Mountain Rescue Team
State of Nevada	United States Forest Service
Domestic & International Public Safety and Other Governmental Customers of Other MSS Providers	
American Red Cross	Central Intelligence Agency
Drug Enforcement Administration	Defense Information Systems Agency
Federal Aviation Administration (through private company, ARNAV)	Fire Department of New York
Federal Bureau of Investigation	Federal Emergency Management Agency
International Red Cross	Ministry of Maritime Fisheries (Morocco)
National Communications Systems	National Science Foundation
Navy SEAL Insertion Team	Netherlands Coast Guard
New York Police Department	Oxfam International
State of New York	Telecoms Sans Frontieres (international NGO)
Touchdown (New Zealand)	UNICEF
United Nations High Comm. for Refugees	United Nations Relief and Work Agency
U.S. Air Force	U.S. Coast Guard
U.S. Department of Defense	U.S. Federal Protective Service
U.S. Secret Service	U.S. Special Forces
Washington, D.C.'s Emergency Management Agency	
Private Sector Customers of Globalstar	
Amazingoutdoors.com	AO Tyumenergo (Electric Power, Russia)
Baltic Construction Company (Russia)	Blackheath (Australia)
BoatTEST.com	Carter and Hail Contracting
Caspian Pipeline Consortium (Russia)	DSND CONSUB (Brazil)
Federal Group Hotels	FedEx Pilot's Association
Fixed services in remote communities across Venezuela and elsewhere in Latin America	Gear Up Florida
Giotto Perspectives (IT analyst)	Izumi Outdoors Inc.
Kennecott Mining Exploration Co.	MayaQuest
North Star	Podolsky Inc. (Trucking)
Popular Communications	SEDCO Oil Platform (Brazil)
Team Adventure	US Television Networks (i.e., ABC, NBC)
West Coast Energy regions in British Columbia	Weyerhaeuser Company Ltd. (Canada)

[Attachment to July 26, 2002
Written Ex Parte]

AKIN GUMP
STRAUSS HAUER & FELD LLP
Attorneys at Law

TOM DAVIDSON
(703) 891-7540/Fax: (703) 891-7501
tdavidson@akingump.com

July 26, 2002

VIA ELECTRONIC FILING

Ms. Marlene Dortch
Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Re: Written Ex Parte Communication in IB Docket No. 01-185
Grant of Ancillary Terrestrial Component Authority to
Mobile-Satellite Service Licensees

Dear Ms. Dortch:

The Official Creditors' Committee ("Creditors") of Globalstar, L.P. ("Globalstar") is filing this informal pleading with the Federal Communications Commission ("Commission") to support Commission grant of ancillary terrestrial component ("ATC") authority to Mobile-Satellite Service ("MSS") licensees in IB Docket No. 01-185. This pleading elaborates upon the myriad of public interest benefits provided by the MSS industry, including the provision of ubiquitous mobile communications capabilities to rural Americans and public safety and homeland security agencies. As set forth herein, the Creditors believe that, if the Commission fails to grant ATC authority in the instant proceeding, these benefits eventually will be lost as current operating systems degrade. Therefore, the Creditors request the Commission expeditiously to grant ATC authority to MSS licensees.

The Creditors represent the interests of investors in Globalstar that currently hold approximately $3.5 billion of Globalstar debt and liabilities. The Creditors have funded the substantial majority of Globalstar's satellite system deployment and operations to date.

Please do not hesitate to contact the undersigned with any questions that you may have regarding this matter.

Sincerely,

/s/ Tom Davidson

Tom Davidson, Esq.
Counsel for Official Creditors Committee of Globalstar, L.P.

ATTACHMENT C

VIA FACSIMILE AND E-MAIL

May 1, 2003

Thomas S. Tycz
Chief, Satellite Division
International Bureau
Federal Communications Commission
445 12th Street, S.W., Room 6-A665
Washington, DC 20554

Re: Request for Special Temporary Authority for Iridium Constellation, LLC To Provide Mobile Satellite Service In The 1616-1621.35 MHz Frequency Band

Dear Mr. Tycz:

This responds to the letter from counsel for Iridium Constellation, LLC, dated May 1, 2003, requesting special temporary authority ("STA") to continue to use Globalstar's L-band CDMA spectrum from 1618.85 – 1620.10 MHz (Globalstar's "channel 8") through May 13. Iridium currently holds STA, with Globalstar's consent, to use Globalstar's Channel 9 (1620.10 – 1621.35 MHz) through May 13 and Channel 8 through May 2. Counsel states that Iridium requires channel 8 "to meet the continuing needs of government operations in the Middle East." Counsel also states that Globalstar advised counsel that Globalstar was "likely not to object" to this extension.[1]

On April 24, I wrote by e-mail to Commission and NTIA staff (see Attachment 2, the "April 24 E-mail") consenting on behalf of Globalstar to the outstanding STA for Channel 8. In doing so, I advised the Commission and NTIA that (1) Iridium did not appear to be heavily using the previously-authorized Channel 9 and (2) that Iridium's radio link failure was possibly attributable to interference into the L-band from external sources. I concluded that the service problems Iridium claimed to be experiencing would very likely not be resolved with additional spectrum. We are now more convinced than ever that Iridium's service problems, to the extent that they genuinely exists, have little or nothing to do with the amount of spectrum available.

[1] Counsel quoted an e-mail comment from the undersigned out of context. The full e-mail is Attachment 1.

In the April 24 E-mail, I noted that "Iridium is hardly putting any traffic on the Channel 9 spectrum." We can observe this simply by connecting a spectrum analyzer at our Gateway telemetry & control stations and recording the activity of our C-band feeder link frequencies. Attachment 3 to this letter explains the way we do this in more detail. For the past week we have been observing Channel 8 with a spectrum analyzer. We have observed that Iridium is hardly using Channel 8 either. If Iridium were using Globalstar's spectrum as intensively as Iridium's STA letters imply is necessary, then we should see up to 18 of Iridium's 41.67 kHz carriers in each of Globalstar's 1.25 MHz channels. We are seeing an average of 1.6 in Channel 8, or 9 percent of the available spectrum. (Our calculations are explained more fully in Attachment 3.[2]) This is a stunningly inefficient use of the spectrum resource.

Furthermore, Iridium is using the Channel 8 frequencies right up to the band edge with the next lower channel Globalstar channel (Channel 7), and not allowing for any guardband. Because Iridium has not accounted for Doppler effects, Iridium is actually transmitting in Globalstar's Channel 7.[3] We cannot discern whether Iridium cannot control its channel assignments precisely or whether Iridium decided not to take steps to operate within its authorized spectrum.

Counsel's letters of April 25 and May 1 provide no factual support for continuation or extension of these STAs. First, tests performed by an independent consultant for Globalstar in the Summer of 2002 show that Iridium's call acquisition rate is 97 percent, not 99 percent (an insignificant difference, admittedly) but that its average call drop rate is 18.4 percent, not 1 percent as alleged in counsel's letter.[4] That Iridium experiences a particularly high call drop rate under load would not be surprising – so does Globalstar, and so does every cellular system. Second, counsel's April 25 letter cites only raw numbers of acquisition failures. These numbers are meaningless without context. An "average" of 23,368 acquisition failures over a nine day period (April 13 – 21) could well mean that the number of failures was very high at the beginning of the period and completely to normal at the end – which we suspect is the case here. The April 25 letter does not even state where these call drops occurred – only in the Middle East or system-wide. We already know that Iridium cannot confine its use of Globalstar's Channels 8 and 9 to the Middle East Region, as originally represented. There is no evidence presented that Iridium is capable of isolating the location and cause of any single dropped call.

Finally, the war in Iraq is over for all intents and purposes. The volume of allegedly mission-critical calling must have dropped dramatically during the week of April 21, if not earlier. By the same token, the interference into the L-band described in Attachment 2 has probably

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[2] The "Figures" in Attachment 3 will not be legible in their reduced versions. They show the results of the spectrum analysis.

[3] We do not suffer interference from Iridium's operations at the regulatory boundary of 1621.35 MHz because Globalstar has inserted a guardband above its Channel 9.

[4] Frost & Sullivan, *Satellite Telephone Quality of Service Comparison: Iridium vs. Globalstar*, Figure 2 (July 25, 2002).

abated. Iridium's miniscule use of Channels 8 and 9 bears testimony to the ebbing of demand. Iridium has made no case whatsoever for extension of any STA authority.

Accordingly, Globalstar, L.P. respectfully requests that the Commission allow Iridium's STAs to expire on their stipulated dates.

Sincerely,

GLOBALSTAR, L.P.

By: *//S//*
William F. Adler
Vice President-Legal & Regulatory Affairs

Attachments

CC (via e-mail only): Marsha MacBride
Bryan Tramont
Scott Delacourt
Jennifer Gilsenan
Cassandra Thomas
Linda Haller
Karl Kensinger
Karl Nebbia, NTIA
Peter D. Shields, Counsel to Iridium

Subject: Iridium STA For Channel 8 - DRAFT EMAIL TO ADLER FOR YOUR REVIEW
Date: Thu, 01 May 2003 11:14:30 -0700
From: "William Adler" <william.adler@globalstar.com>
To: "Shields Peter" <pshields@wrf.com>

Peter, I'm afraid I can't respond until later today when I have a meeting with our technical staff. Right now, we are not seeing much, if any, interference, but that may be because we detect hardly any usage on either channel 9 or 8. This begs the question of why Iridium needs another channel when it is not loading the first one. Be that as it may, we are likely not to object to the extension to May 13 in the absence of interference. I promised the FCC staff that I would get them something today so that they would have it no later than the opening of their day tomorrow.

Bill Adler

Subject: Iridium in the Middle East
Date: Thu, 24 Apr 2003 17:57:14 -0700
From: William Adler <william.adler@globalstar.com>
To: knebbia@ntia.doc.gov, Tom Tycz <ttycz@fcc.gov>, lhaller@fcc.gov

Dear Karl, Tom and Linda,

This responds to your calls to me today advising Globalstar that the DOD has asked Iridium to improve its quality of service in Iraq. You indicated that that the addition of the spectrum from 1620.10 - 1621.35 MHz (Globalstar's Channel 9), as authorized in the STAs granted on April 11 (3 days) and April 14 (30 days), has not resulted in the hoped for improvement in service. You said that Iridium would like to use additional Globalstar spectrum from 1618.85 - 1620.10 MHz (Channel 8) for 30 days.

We have monitored our own satellites and Iridium's use of Channel 9 continuously for the past 12 days. Our telemetry & control (T&C) site at our gateway in Aussaguel, France, can see Iridium's satellites transiting Europe and the Middle East. The good news for Globalstar is that we have not experienced harmful interference into our satellites. Furthermore, we did not expect to experience a degradation in the quality of service (QoS) to our customers because we were able to replace Channel 9, and we haven't.

The more interesting news for purposes of this matter is that Iridium is hardly putting any traffic on the Channel 9 spectrum - we detected only very low utilization. If Iridium were actually handling 530,000 minutes in the Middle East region over a weekend, and that amount of traffic were causing the congestion and satellite failures, then surely there would have been heavier use of Channel 9 than we detected.

There is a second interesting piece of relevant information. Globalstar, like Iridium, is experiencing highly localized degradation in service quality (i.e., radio link failure) in the Middle East. Ours occurs in Kuwait and in Basra, Iraq, where the British Military and others are using our phones extensively. Our call success rate in that geographic area is under 60 percent, more than 20 percentage points lower than the call success rate in other heavy-use areas served by the same Riyadh Gateway. Because the radio link failure is so localized for both operators, we believe that Iridium's service problems are caused not by traffic congestion but by harmful interference into the L-band. We hypothesize that the interference comes from military radars and other military sources, especially from ships in the Persian Gulf and the Gulf of Oman. Iridium's narrow-band TDMA channels would be even more susceptible to such interference than Globalstar's wideband CDMA channels.

If it is true - and this could be confirmed by measurement - that the complained-of service failures are caused principally by interference into the L-band and not by an unusually high volume of usage, then further augmenting Iridium's spectrum assignment is not going to solve Iridium's problem. When the interfering signals abate, the QoS will improve. We believe that

someone who is not affiliated with Iridium should undertake to communicate our observations - namely, the alternative cause for the poor service quality - directly to the DOD.

That said, based on the absence of harmful interference thus far, Globalstar is willing to consent to Iridium's use of Channel 8, at least for one week while we monitor the impact on our operations. We cannot vacate Channel 8 at this time because it is needed in Moscow and other Gateways; however, based on Iridium's very light use of Channel 9, we are willing to accept the possibility of interference and degraded service on Channel 8 through May 2. We must point out here that the Iridium System does not appear capable of limiting use of these additional channels to the Middle East, as Iridium has represented. We detected some usage of Channel 9, at least for purposes of setting up calls, in the U.S. and at other locations around the World.

Do not hesitate to contact me if you require additional information.

Sincerely,

Bill Adler
VP-Legal & Regulatory Affairs
408-933-4401

Attachment 3

May 1, 2003

Engineering Analysis of Iridium Interference into Globalstar

The Globalstar satellites have a repeating transponder which converts the return link uplink frequencies from user terminals at L band into C band downlink frequencies transmitted to the gateway. Unlike the Iridium satellites, there is no on-board processing. As a result, by looking on a spectrum analyzer at C band frequencies at the gateway, we are able to obtain a good spectral analysis of signals being transmitted in the L band uplink, including the Iridium user uplink signals. Our observations of these Iridium signals over a period of multiple satellite passes over the Middle East indicate the following:

a. Iridium does not account for the Doppler frequency shift due to satellite motion, at least not for the Globalstar satellites, which can be as high as 37 kHz at L band and 163 kHz at C band. Probably as a result of this, we see interfering Iridium signals about 150 to 200 kHz inside of our channel 7. This could be corrected by Iridium's providing a 200 kHz guard band above our channel 7. These signals have a carrier-to- noise ratio (C/N) in a 10 kHz band which ranges from 6 to 22 dB, which is consistent with our calculations of their expected signal strength.

   The attached spectrum analyzer plots show the results of some of our typical measurements taken on various satellites over a several hour period.

b. Iridium's previous filings with the FCC state that their carrier separation is 41.67 kHz. Their capacity calculations are consistent with this carrier separation. However, all of the Iridium signals that we have seen indicate that they are using carriers that are approximately 150 kHz apart. This may be due to the fact that they cannot compensate for Doppler effects at L band, and they use instead a wider bandwidth that does not track the signal frequency variation due to Doppler. As a result, they are using their L band spectrum allocation inefficiently, leading to a capacity reduction relative to their stated capacity in the Big LEO Negotiated Rule Making Proceeding. We believe that this explains why they are constantly running out of spectrum in their allocated L band frequency band.

   Table 1 summarizes the percentage of times over a 1-hour period that we have seen different numbers of Iridium carriers in our channel 8. If Iridium optimized efficient use of this spectrum, and actually used carriers spaced 41.67 kHz apart, we would expect 29 carriers in one of our 1.23 MHz channels (with a full frequency reuse pattern) or about 6 carriers per 1.23 MHz per Iridium beam if they used the factor of 5 frequency reuse that they claim in their previous FCC filings. Taking into account the difference in area covered by an average Iridium satellite beam versus a Globalstar satellite beam, we expect three Iridium beams to fall into one Globalstar beam. If Iridium were using its spectrum efficiently, we would expect at least 18

carriers to be seen in one Globalstar beam in one of our channels, such as channel 8. The numbers of carriers seen, shown in Table 1, is much lower. Globalstar saw an average of 1.6 carriers in 1.23 MHz for the duration of time that we observed, which was during a period of peak traffic over the middle East.

Table 1: Distribution of numbers of Iridium carriers in Globalstar channel 8

Number of Iridium carriers in channel 8	Percentage of time seen
0	21
1	33
2	21
3	12
4	12

Using the above average of 1.6 carriers in channel 8, as opposed to the expected 18 carriers in channel 8, we believe that Iridium is actually operating at about 9% of the capacity that was asserted during the Big LEO Negotiated Rule Making Proceeding. Table 2 shows what this means in terms of numbers of subscribers served over Iraq. We see that their expected number of busy hour subscribers served is about 27,698 instead of a potential 307,756 in their 5.15 MHz band.

Table 2: Calculated Iridium capacity over Iraq

Iridium (voice subscriber) capacity estimates

CONUS capacity in 5.5 MHz (from NRM)	2556 full duplex circuits
CONUS capacity in 5.15 MHz	2393.345455 full duplex circuits
Traffic intensity, busy hour Erlangs/sub	0.003 assumption 1
Total # subs in busy hour, CONUS	797781.8182
Ratio of area Iraq/CONUS	0.385765517
Capacity over Iraq, based on NRM, 5.15 MHz	923.2701472 full duplex circuits
Capacity over Iraq, based on est. 9% usage	83.09431325 full duplex circuits
NRM based est. of subs/busy hr in 5.15 MHz, Iraq	307756.7157
Total # subs/busy hr in 5.15 MHz, Iraq	27698.10442 assumption 1

c. Lastly, if Iridium were using channel 8 efficiently, Globalstar would see a decrease in call success rate in countries north of Iraq were Globalstar still uses channel 8. Also, the Globalstar satellites would show increased usage of their L-C transponder due to Iridium's use of channels 8 and 9. Globalstar is not experiencing either of those effects which leads to the conclusion that Iridium is using channels 8 and 9 very sparingly.

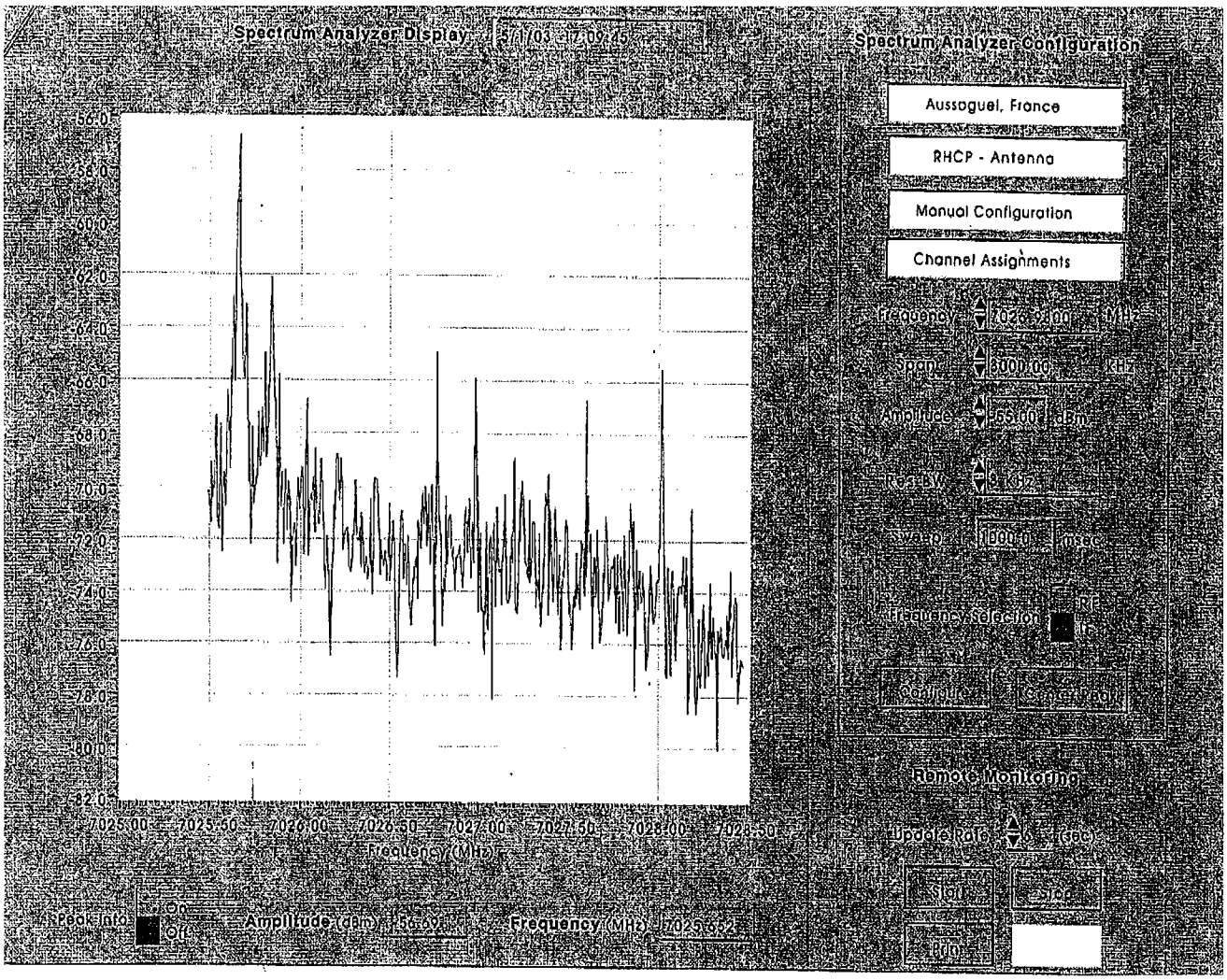

Figure 1: C band spectrum; Upper edge of channel 7 is 7025.745 MHz; upper edge of channel 8 is 7026.975 MHz

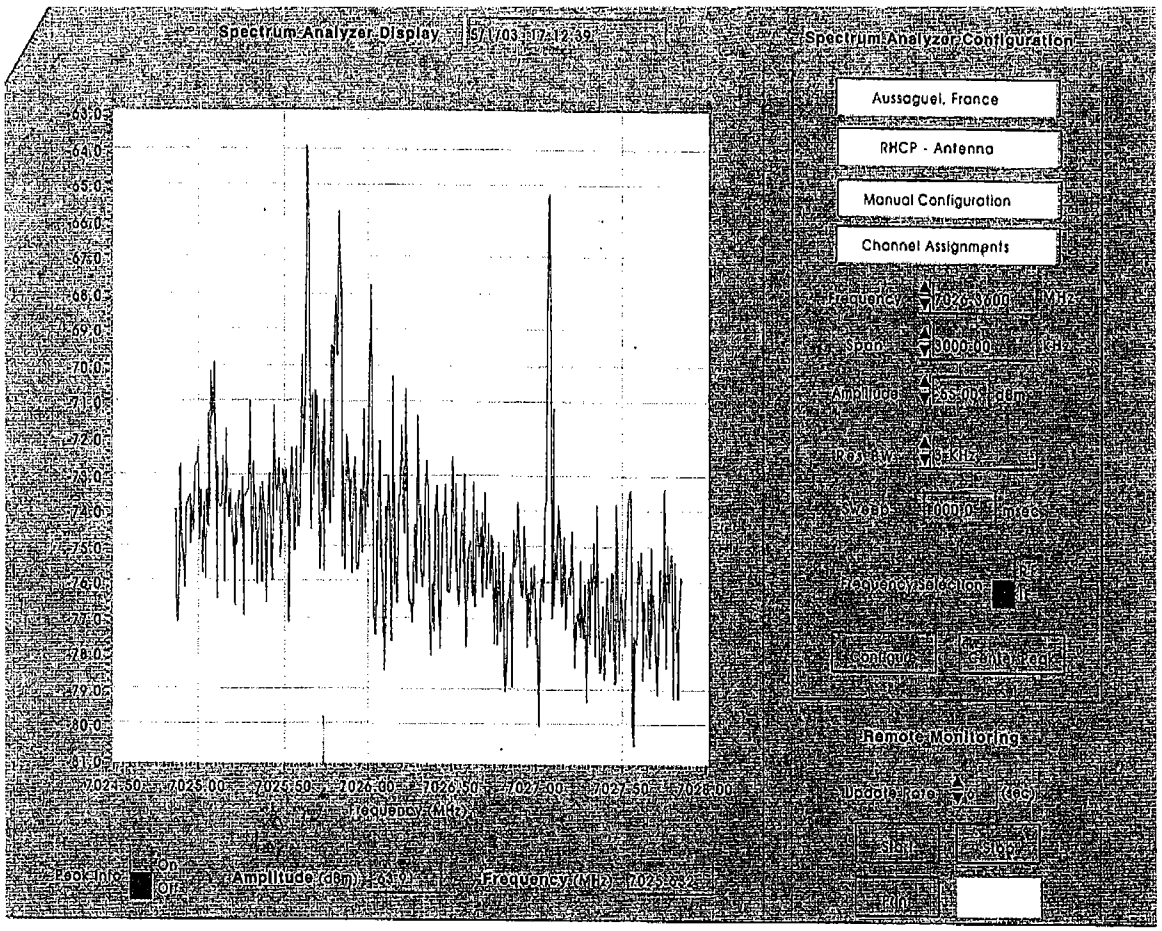

Figure 2: C band spectrum; Upper edge of channel 7 is 7025.745 MHz; upper edge of channel 8 is 7026.975 MHz

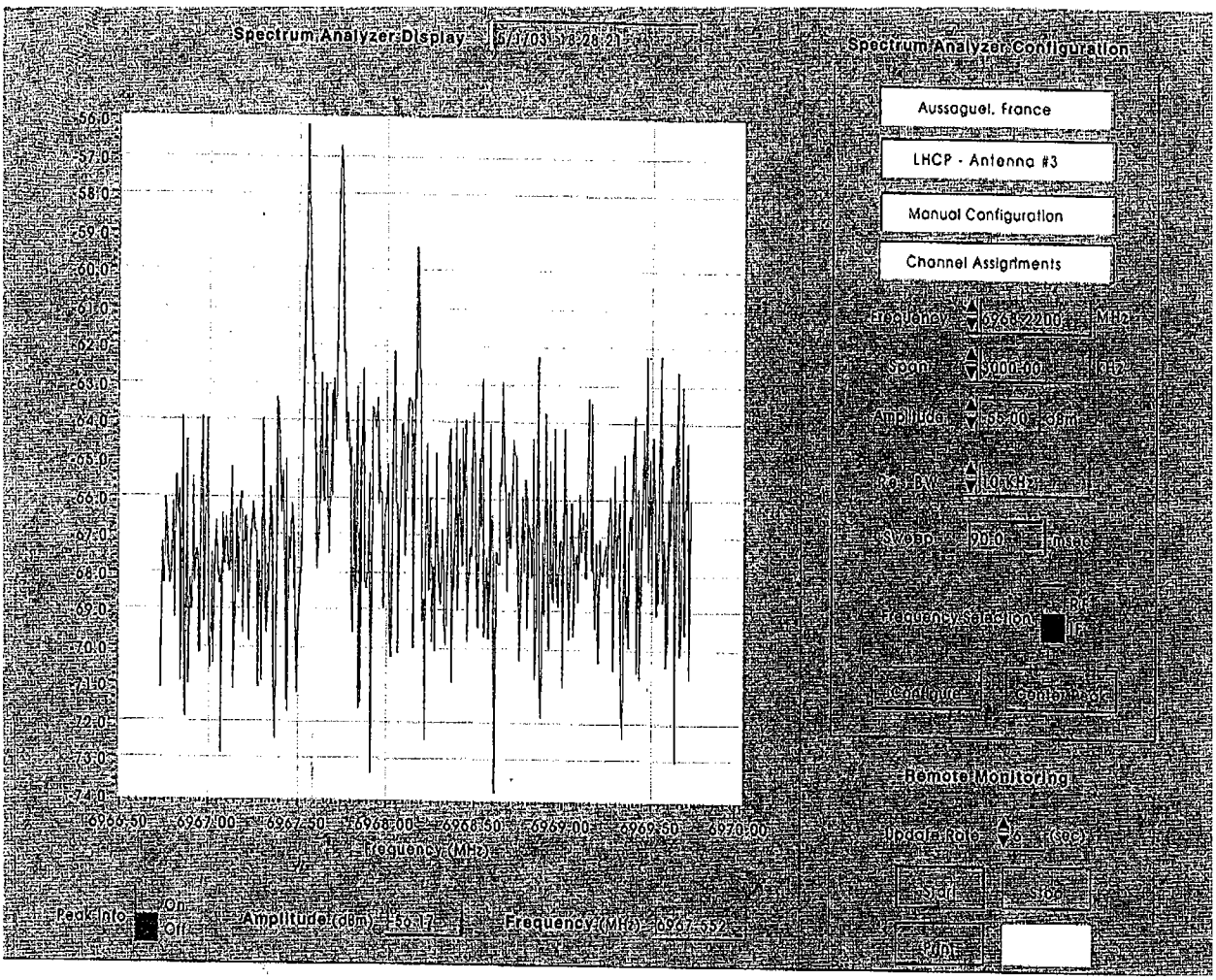

Figure 3: C band spectrum; Upper edge of channel 7 is 6967.605 MHz; upper edge of channel 8 is 6968.835 MHz

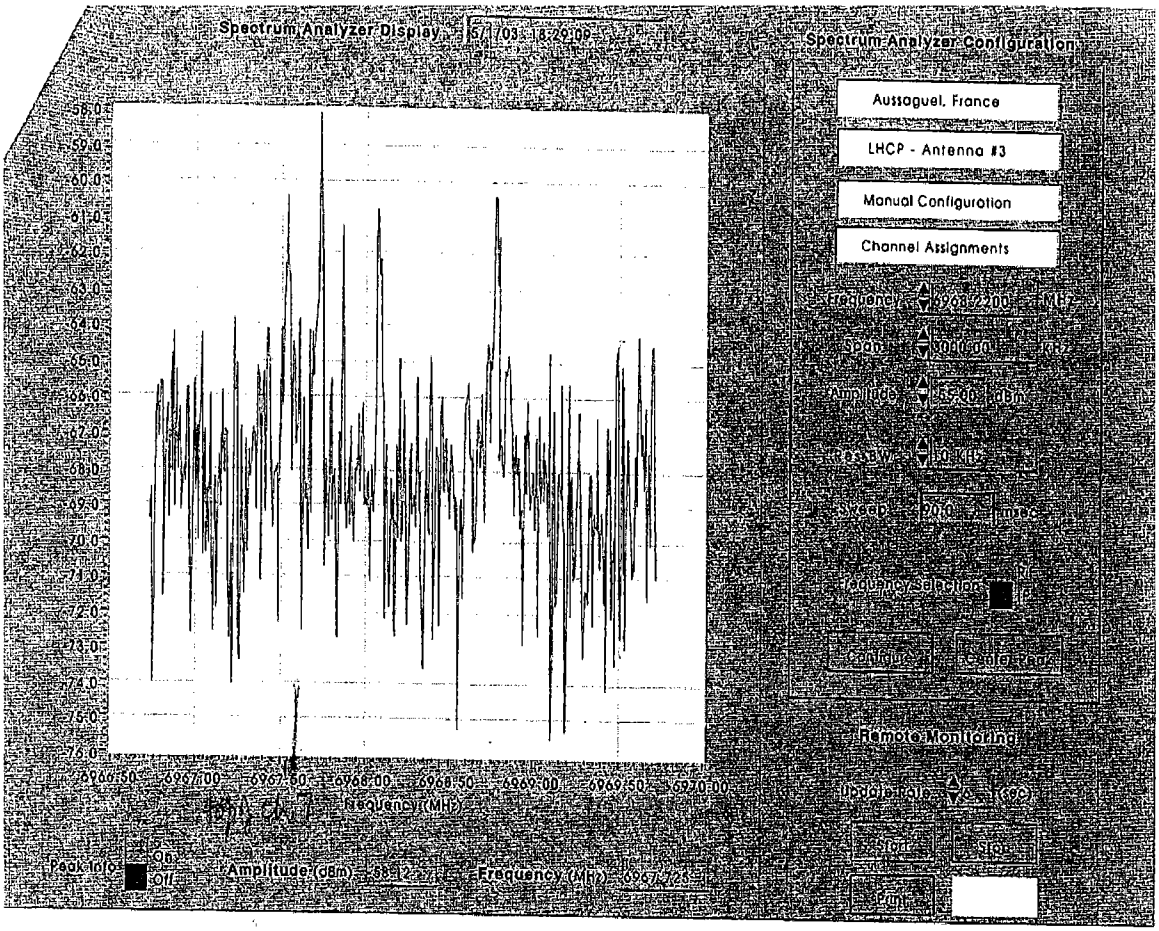

Figure 4: C band spectrum; Upper edge of channel 7 is 6967.605 MHz; upper edge of channel 8 is 6968.835 MHz

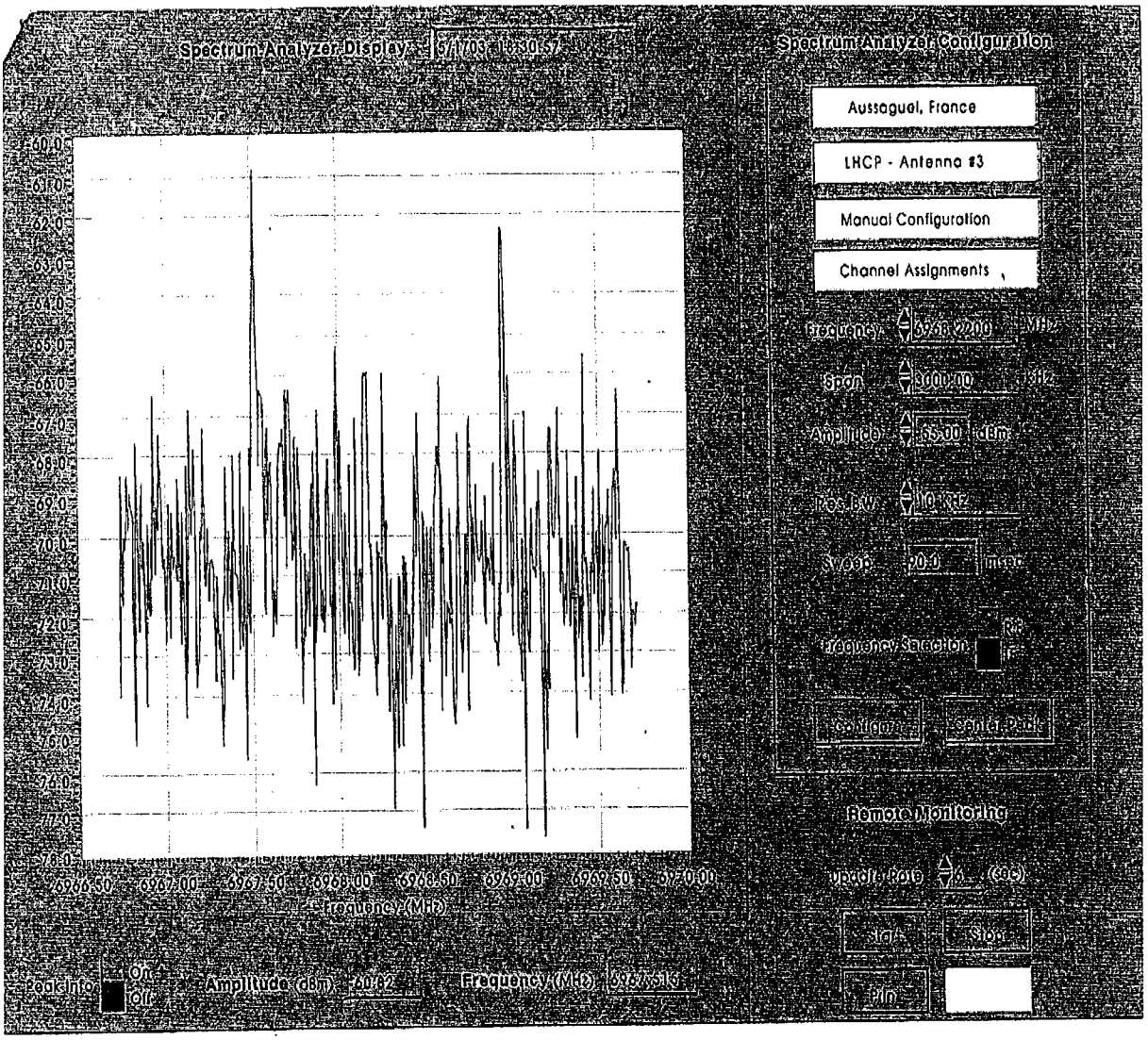

Figure 5: C band spectrum; Upper edge of channel 7 is 6967.605 MHz; upper edge of channel 8 is 6968.835 MHz

ATTACHMENT D

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May 8, 2003

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Via Facsimile and E-mail

Thomas S. Tycz
Chief, Satellite Division
International Bureau
Federal Communications Commission
445 12th Street, S.W., Room 6-A665
Washington, DC 20554

Re: Response to Globalstar's May 1, 2003 Letter

Dear Mr. Tycz:

Iridium Constellation LLC ("Iridium") hereby responds to Globalstar L.P's May 1, 2003 letter ("Globalstar Opposition") opposing extension through May 13, 2003 of Iridium's special temporary authority ("STA") to provide global mobile satellite service ("MSS") in the 1618.85-1620.10 MHz frequency band ("Globalstar Channel 8").[1] In its Opposition, Globalstar admits that its system is not experiencing interference from Iridium's use of Channel 8. Moreover, its Opposition provides no technical support for discontinuance of Iridium's STA.

As explained in detail below, data collected and analyzed over the previous 45 days makes clear that Iridium is using all available spectrum at or near peak capacity – both prior to and following grant of the STAs. Iridium has collected data from multiple engineering sources, and the data includes millions of Call Detail Records ("CDRs") and gigabytes of satellite telemetry. This data set is voluminous and complete, goes well beyond Globalstar's questionable spectrum analyzer-based loading analysis, and conclusively demonstrates the following:

1) Iridium's "no-channel available" call denial rates have dropped by 95% since it received STA to use the first 1.25 MHz channel on April 11; and
2) Iridium's "dropped call" rate (*i.e.*, due to poor channel quality (low C/I)) in the Middle East region has decreased markedly (*i.e.*, from approximately 35% to 27%).

As discussed more fully below, these recent improvements in Iridium quality of service ("QoS") are directly attributable to Iridium's access to additional user-link

[1] Letter from William F. Adler, Globalstar L.P., to Thomas S. Tycz, Chief, Satellite Division, International Bureau, FCC, page 1 (May 1, 2003) ("Globalstar Opposition").

spectrum beginning on April 12, 2003. Accordingly, the Commission should not prohibit Iridium's continued use of Channel 8 through May 13, 2003 as Globalstar requests.

I. Iridium Is Heavily Using Channels 8 and 9

In its Opposition, Globalstar claims that Iridium "is hardly putting any traffic on the Channel 9 spectrum"[2] and "is hardly using channel 8 either."[3] Actual system utilization data, however, refutes this claim. As Attachment 1 illustrates, since April 11, 2003, Iridium Middle East system utilization has approached or exceeded 200,000 call minutes per day. Notably, as Attachment 2 makes clear, the 2.5 MHz of spectrum granted to Iridium on a special temporary basis carried well in excess of 60,000 call minutes per day in the Middle East region. These high volumes show no sign of dissipating, despite the end of the "major combat phase" of the Iraq war.[4]

Moreover, this high call volume is evenly loaded across all available Iridium channels, including the channels authorized for Iridium use by STA. Iridium routinely monitors actual loading data for up to 150 simultaneous calls.[5] During a representative period from May 2, 2003 10:00 GMT to May 3, 2003 12:00 GMT, Iridium extensively analyzed loading resulting from over 50,000 calls. As depicted in Attachment 3, these calls were evenly distributed among the 21 sub-bands available to Iridium (numbered 10-30). Notably, sub-bands 10 through 16 are within the two Globalstar channels (*i.e.,* 1618.85-1621.35 MHz).

Globalstar opposes Iridium's continued use of Channel 8 because it estimates that Iridium is using only "9 percent of the available spectrum."[6] In arriving at that conclusion, Globalstar states that it expected "to see up to 18" Iridium carriers in each of Globalstar's 1.25 MHz channels, but was only "seeing an average of 1.6 [Iridium carriers] in Channel 8."[7]

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[2] Globalstar Opposition at Attachment 2, page 1.
[3] Globalstar Opposition at 2.
[4] Globalstar's observation that "the war in Iraq is over for all intents and purposes" does not correlate—as Globalstar would have the FCC believe—into reduced demand. Globalstar Opposition at 2.
[5] Less specific data is available for calls exceeding 150.
[6] Globalstar Opposition, page 2.
[7] Globalstar Opposition, page 2.

Globalstar's estimation of Iridium's spectrum use contains numerous flaws. As with any cellular or satellite network, the maximum supportable traffic load on the Iridium network depends on the geographical distribution of the offered traffic. More widely dispersed traffic optimizes the frequency reuse potential of the Iridium system – much like distributing cellular traffic across multiple cells – rather than collocating all users in a single cell. Since the early part of this year, the Iridium traffic emanating out of the Middle East region has remained extremely "dense" geographically. Therefore, any capacity analysis for this region must account for this traffic distribution—which Globalstar's estimates fail to do. Instead, Globalstar looks only at a particular region when measuring loading on a particular channel. However, because channels on Iridium's satellite system are allocated for each satellite based on frequency/beam reuse considerations, at any given moment, channels 8 and 9 are actually being distributed throughout the satellite footprint covering the Middle East and surrounding regions.

Taking these issues account, Iridium's calculated average use of available spectrum is 64.18%—significantly higher than the 9% estimated by Globalstar. The following bullet points detail Iridium's calculation of this percentage:

- The addition of two 1.25 MHz CDMA channels gives Iridium a total of 60 41.67 kHz physical FDMA traffic carriers.

- System overhead channels, beam-to-beam reuse restrictions, and reserve channel capacity (required to support beam-to-beam handoffs) reduce the percentage by which these 60 channels can be (exclusively) loaded into peak beams.

- This leaves approximately 35 traffic channels per timeslot (in 2.5 MHz of spectrum).

- Four timeslots (per TDMA frame) times 35 channels/timeslot = 140 traffic channels (or 140 peak traffic channels available in 2.5 MHz of spectrum when including system overhead and reserve).

- 140 peak traffic channels times 1440 min/day = 201,600 maximum call minutes supportable per day (if all peak beam on-air traffic channels are fully utilized 24 hours/day).

- Currently, the ratio of Iridium Peak Busy Hour ("PBH") peak traffic loading to Iridium's 24-hour average traffic loading is 1.89 (that is, the ratio of the supported call load over the Middle East during the time period 16:00Z-19:00Z, as compared to the 24 hour average load).

- Siemens switch "call detail records" ("CDRs") and SV telemetry-based call-image-record ("CIR") data from the Iridium Space Network Operations Center indicate that the average channel minutes supported within this 2.5 MHz band was 68,382 minutes per day over the period April 26-May 3, 2003 (*i.e.,* after grant of the second STA).

- Factoring in the 1.89 peak-to-average load factor, the equivalent 24-hour call load supported during PBH by this 2.5 MHz was 1.89 x 68,382 = 129,242 minutes/day.

- This equates to an average spectral utilization factor of **64.18%** during PBH. Within these channels, the daily minute resource usage is included in the table below:

Date	Resource Minutes	% Resources Used
4/26/2003	70527.8	65.9
4/27/2003	66422.7	62.3
4/28/2003	70002.8	65.6
4/29/2003	68909.7	64.6
4/30/2003	69375.4	65.0
5/1/2003	66528.3	62.4
5/2/2003	64898.0	60.8
5/3/2003	70391.8	66.0
AVERAGE	68382.0	64.18

There are two fundamental system "observables" that indicate the system is operating at its spectrum capacity limit. These are:

1) The loaded satellite denies new call attempts when the satellite can not find a single physical channel to assign to new call attempts; and

2) The quality of the assigned traffic channels degrades as channels are reassigned to beams in close physical proximity to one another.

Both of the "observables" are directly measurable by satellite telemetry. Indeed, as Attachment 4 shows, both of these phenomena were occurring excessively prior to obtaining the additional 2.5 MHz spectrum.

II. Access to Additional Spectrum Directly Improves Iridium's Quality of Service

Globalstar suggests that "the service problems Iridium claimed to be experiencing would very likely not be resolved with additional spectrum."[8] To the contrary, Iridium's recent QoS improvements are the direct result of access to additional spectrum. As Iridium noted in its STA request, there are three primary causes for QoS degradation in the Middle East region: (1) "No Channel Available"; (2) Satellite Flow Control; and (3) Poor Channel Quality (Low C/I).[9] As explained below, each of these QoS indicia improved following STA grants of additional spectrum to Iridium.

Iridium satellites count the number of acquisition attempts that can not be granted solely due to insufficient spectrum (*i.e.,* no channel available). On April 11, 2003—prior to the STA granting Iridium use of Globalstar Channel 9—the Iridium satellites recorded well in excess of 100,000 failed acquisition attempts. However, following grant of the STAs, Iridium's acquisition failures decreased dramatically:

- **Following grant of the first 1.25 MHz STA on April 11:** Acquisition failures dropped 75 percent.

- **Following grant of the second 1.25 MHz STA on April 25:** Acquisition failures dropped 95 percent from their April 11 levels.

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[8] Globalstar Opposition, page 1.

[9] Letter from Peter Shields, Counsel to Iridium, to Tom Tycz, FCC (Apr. 25, 2003) ("April 25 Letter") at 2.

As noted previously, Attachment 4 depicts acquisition failure trends graphically over the past several weeks.[10] This graph shows actual acquisition failures recorded on the Iridium system for each day from April 1 through May 6, 2003. Importantly, the "average" of 23,000 acquisition failures cited in the April 25 Letter are evenly disbursed throughout the period. Thus, this graph clearly refutes Globalstar's claim that the acquisition failures were concentrated in the beginning of a nine-day period from April 13-21.[11]

Globalstar also questions Iridium's ability to isolate the location of these call acquisition failures to the Middle East region.[12] Because these failed acquisition attempts occur on the satellites servicing the Middle East region and are collected and tagged by satellite and time of occurrence, it is certain that these acquisition failures are occurring in the Middle East region.

III. Iridium's Call Drop Rates Improve With Additional Spectrum

Globalstar accuses Iridium of misrepresenting its call drop rates. Specifically, Globalstar alleges that an unidentified, "independent consultant for Globalstar" reported that Iridium's average call drop rate during the Summer of 2002 was "18.4 percent, not 1 percent as alleged in counsel's letter."[13]

Not only does Globalstar confuse Iridium's "real world" call drop rate with the system baseline call drop rate achieved by continuously running "autodialer" tests, but these "independent" tests results funded and referenced by Globalstar are flawed and not representative of Iridium's nominal performance. As discussed briefly in Iridium's April 25 Letter, three continuously running autodialer test sites track Iridium system setup and dropped call performance from unobstructed locations around the world. Each of these autodialer sites tracks:
(1) number of attempts; (2) number of calls established; and (3) and number of dropped calls. This data is generated and collected continuously everyday throughout the year. Attachment 5 summarizes the autodialer data for three of these sites. It should be noted that the each of these autodialers makes use of the

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[10] Because Iridium instituted flow control to protect its satellites, its data regarding acquisition failures during periods of peak usage understate the actual number of times users attempted to access the Iridium system, but were unable to.
[11] GlobalStar Opposition, page 2.
[12] Although Globalstar's letter refers to "call drops", the context indicates that Globalstar was questioning the location of Iridium's call acquisition failures. Globalstar Opposition, page 2.
[13] Globalstar Opposition, page 2.

constellation cross links to reach the designated Iridium Gateway. As indicated on Attachment 5, for the first four months of 2003, the Iridium system:

- handled nearly 400,000 auto calls;
- achieved a 98.5 percent call acquisition rate; and
- experienced a 0.3 percent dropped call rate.

In sum, under light to moderate loading (*i.e.,* with sufficient spectrum), the Iridium system drops less than 1 percent of calls from three unobstructed "autodialer" locations designed to assess the fundamental system quality of service. This performance is impressive when one considers that performance data regarding auto calls between Virginia and the DoD or Tempe gateways are roughly the same as data for auto calls from the Australian test center, which must traverse numerous Iridium intersatellite links en route to the Tempe gateway without being dropped to qualify as a completed call. Moreover, this data is particularly credible given that the Australian autodialer is operated independently of Iridium and is used to verify Iridium quality of service compliance.

Under real world conditions, numerous factors, including a lack of spectrum, line-of-sight obstructions, misdialed phone numbers, and low battery power, affect the Iridium system's call acquisition and drop rates. As explained in the April 25 Letter, for "real world" conditions, Iridium's call drop rate is roughly 10 percent.[14] As shown in Attachment 6, this call drop rate is consistent across four regions (Africa, N. America, International Waters and Caribbean).

Finally, Globalstar further claims that "Iridium's radio link failure was possibly attributable to interference into the L-band from external sources."[15] More precisely, Globalstar acknowledges that its system is "experiencing highly localized degradation in service quality (*i.e.,* radio link failure) in the Middle East" and "hypothesize[s]" that interference coming from military radar may be interfering with Iridium.[16] Iridium acknowledges that the Middle East is currently an RF-rich environment. Furthermore, while it also true that a limited percentage of Iridium's dropped calls in the Middle East region are a direct result of interference generated

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[14] April 25 Letter, page 2.
[15] Globalstar Opposition, page 1.
[16] Globalstar Opposition at Attachment 2, page 2.

external to the Iridium system, this increase in dropped calls is limited to two sub-bands and has had limited impact on the overall Iridium dropped call rates in the Middle East region. Iridium engineers can monitor the existence and frequency of external interference sources based on the wealth of satellite telemetry that the Iridium system, by virtue of its onboard processing based architecture, provides. In addition, Iridium system engineers are able to isolate dropped call statistics - both by sub-band and even by individual channel number. Through this telemetry, Iridium has verified that the vast majority of channels currently affected by external interference are confined to a small group of carriers in the upper end of Iridium's operating band. This interference accounts for less than 5% of Iridium's total calls being dropped within the Middle East region. Thus, Globalstar's claim that Iridium's radio link failures are attributable to interference from external sources is simply not true.

In fact, Iridium satellite telemetry provides continuous visibility into the system internal self-interference (C/I) (*i.e.,* interference that results solely from the high levels of channel reuse between close proximity beams on the Iridium system). It is these intra-system channel reuse degradations that have been dramatically improved (but not eliminated) by the additional STA spectrum. More specifically, prior to April 11 (*i.e.,* grant of the first 1.25 MHz channel STA), the system telemetry logged the use of thousands of low quality (low C/I) channels over the Middle East region on a daily basis. The telemetry-based counts of poor C/I channels have been reduced by more than an order of magnitude since grant of the STAs. It is noteworthy that the rate of Iridium dropped calls in the Middle East region has, in fact, dropped between 6 and 10 percent since the incorporation of 2.5 MHz of additional L-band spectrum pursuant to STA. This unequivocally demonstrates that the dropped call rates have not been exacerbated substantially by RF interference, but have simply been caused by a lack of available spectrum.

IV. Iridium's Use of Channels 8 and 9 Does Not Interfere With Globalstar's Use of These Same Channels

There is no evidence that Iridium's use of channels 8 and 9 has caused harmful interference to Globalstar's operations. Indeed, Globalstar itself has reported, "The good news for Globalstar is that we have not experienced harmful interference into our satellites." [17] Accordingly, Globalstar's opposition to Iridium's

[17] Globalstar Opposition, Attachment 2, page 1.

continued use of Channel 8 appears intended to impair competition rather than prevent interference.

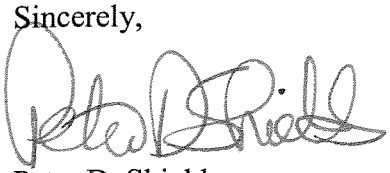
In addition, contrary to Globalstar's allegations, Iridium is *not* transmitting in Globalstar's channel 7.[18] Iridium fully compensates for Doppler effects between the Iridium subscriber equipment and the satellites. Currently, Iridium's lowest satellite sub-band (sub-band 10) edge is at 1619.00 MHz. The maximum Doppler correction made by the handset would generate a lower band edge frequency of 1618.962 MHz, which allows a 112 KHz guard band between Iridium's frequency and the uppermost portion of Globalstar's channel 7.

V. Conclusion

Contrary to Globalstar's assertions, Iridium is using spectrum efficiently to meet on-going needs of coalition forces in the Middle East. Iridium's ability to handle extremely high traffic volumes and provide quality service over the past 30 days is a direct result of getting additional spectrum pursuant to STA. Any reduction in spectrum now would immediately and dramatically degrade system performance, to the detriment of all users of the Iridium system, including DoD, other coalition forces, and commercial users.

In sum, Globalstar admits that its system is not experiencing interference from Iridium's use of Channel 8, and its Opposition provides no technical support for discontinuance of Iridium's STA.

Sincerely,



Peter D. Shields
Counsel to Iridium Constellation, LLC

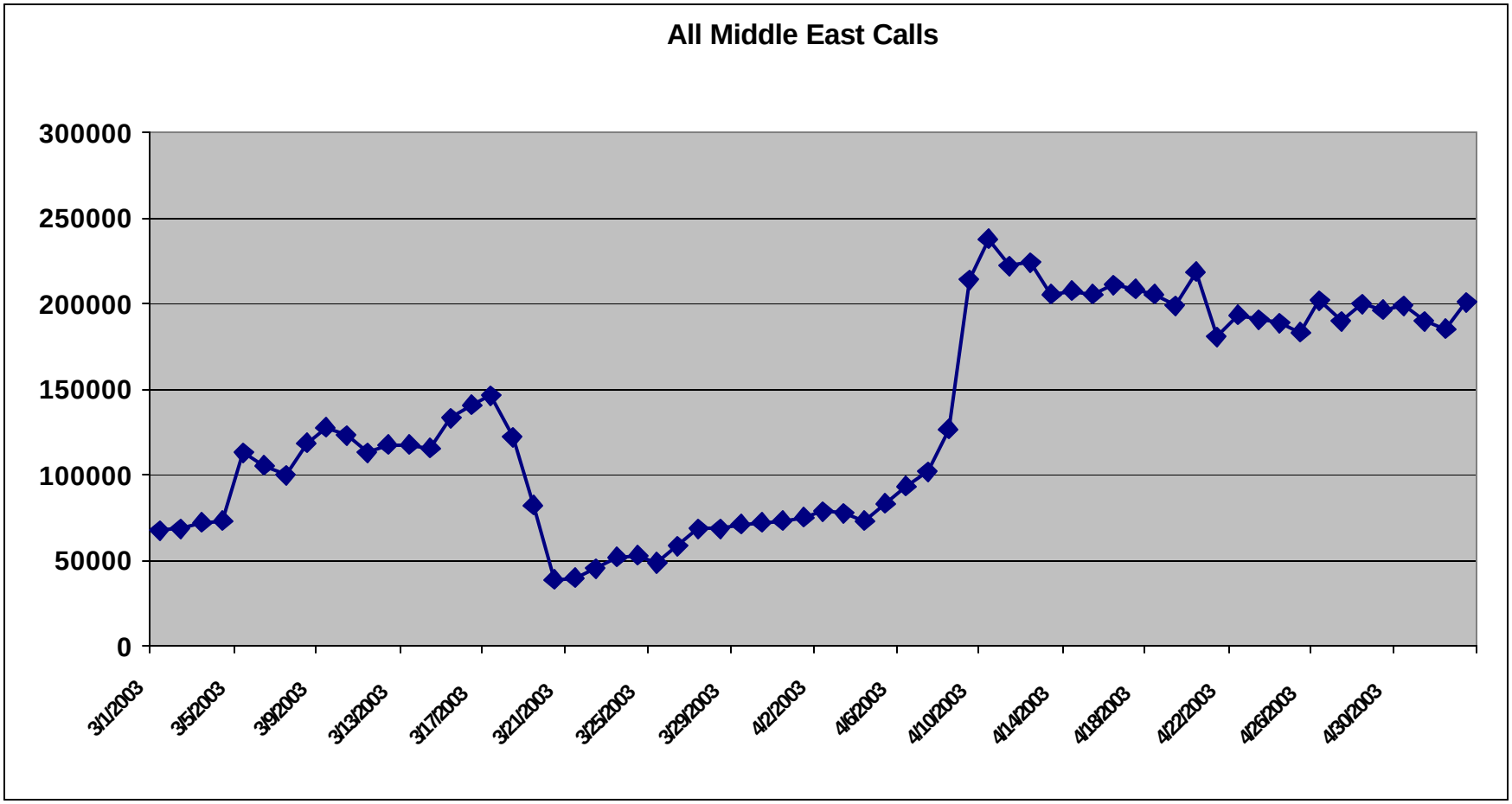
[18] Globalstar Opposition at 2.

cc (via email): Marsha MacBride
Bryan Tramont
Scott Delacourt
Jennifer Gilsenan
Cassandra Thomas
Linda Haller
Karl Kensinger
Karl Nebbia, NTIA
William D. Wallace, Counsel to Globalstar, L.P.
William F. Adler, Globalstar, L.P., Vice President – Legal and Regulatory Affairs

Attachment 1

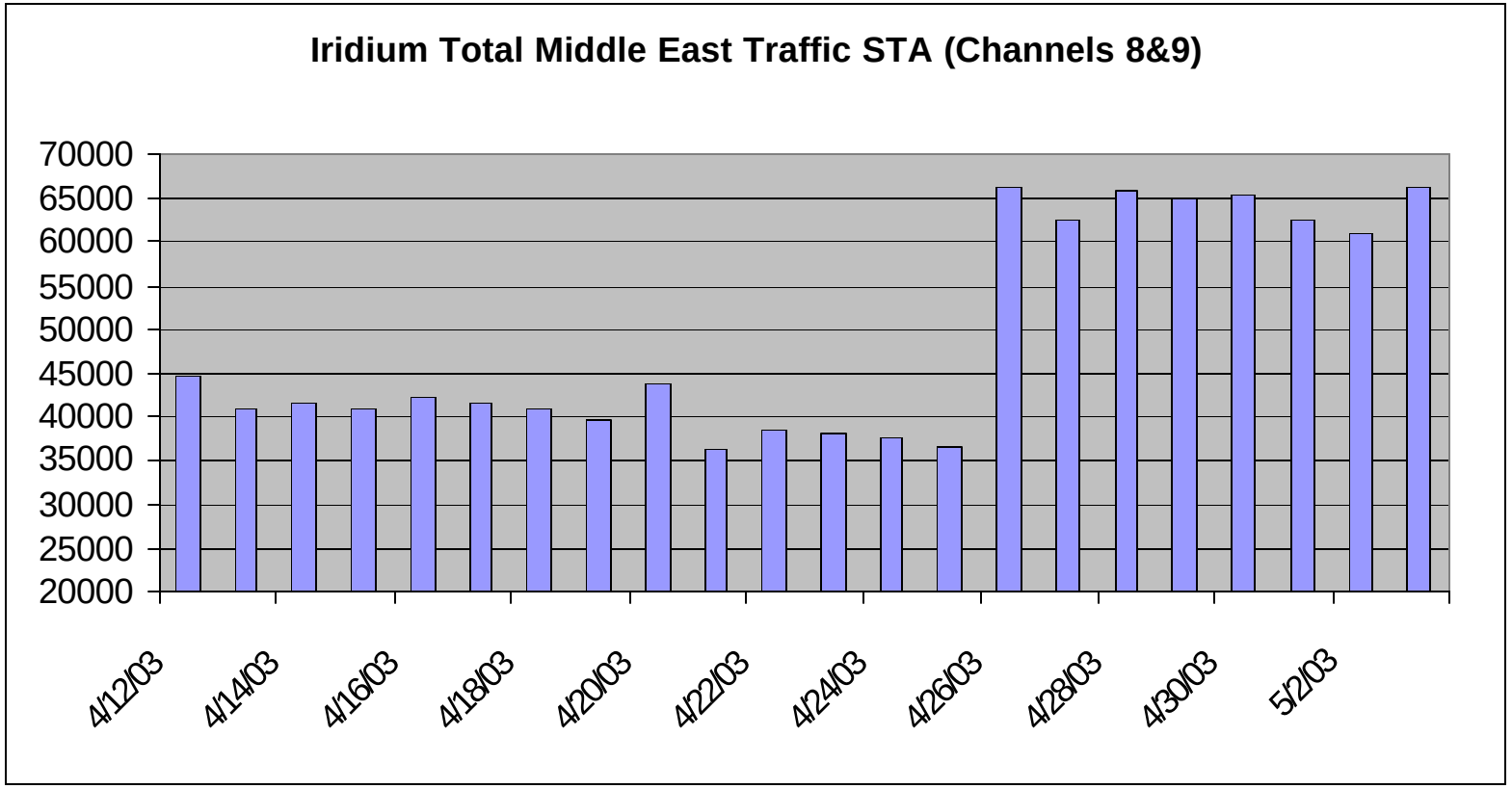
IRIDIUM TRAFFIC GROWTH: CY2003

- **The graph below illustrates the dramatic increase in calls in the Middle East region over the past several months. The X axis contains the date of interest, while the Y axis is number of calls.**



Attachment 2
Iridium Use of STA Channels

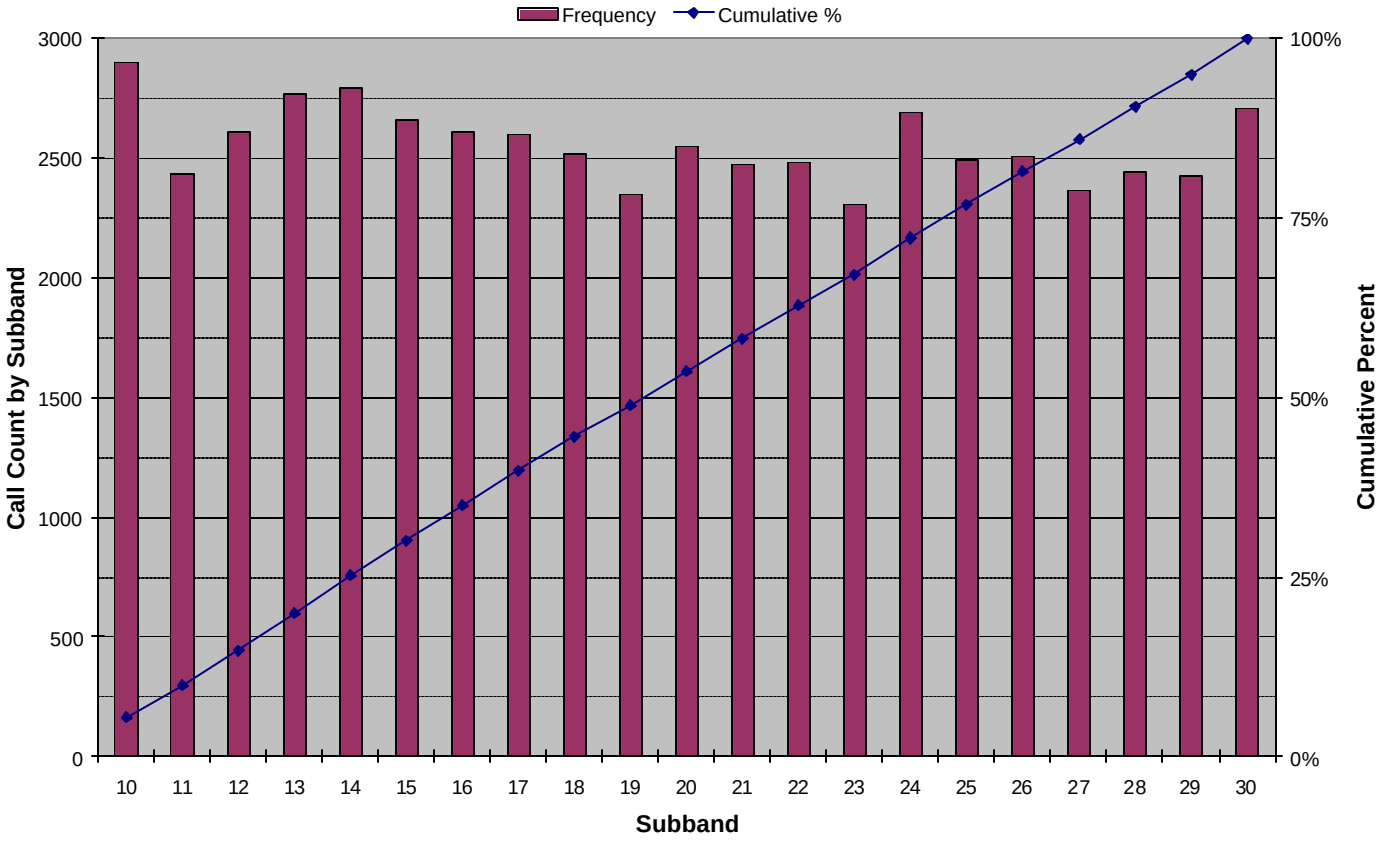
- This graph demonstrates the total call minutes used by STA channels 8 and 9 per day. Channel 9 was made available on April 26.



Attachment 3
Iridium Use of STA Channels

- Iridium immediately incorporated the additional 2.5 MHz of spectrum upon authorization by the FCC
  - Each Satellite randomly assigns channels to spot beams and assigns user channels to optimize C/I. Note the even loading distribution over the 21 sub-bands. Sub-bands 10-16 are STA channels 8 and 9. (This is actual satellite loading data for loads up to 150 simultaneous calls/satellite)

Assigned Traffic Channel Subband at Call Initiation
(53,675 Calls - count based on < 150 connections on a Satelite)
May 2 2003 10:00z to May 3 2003 12:00z

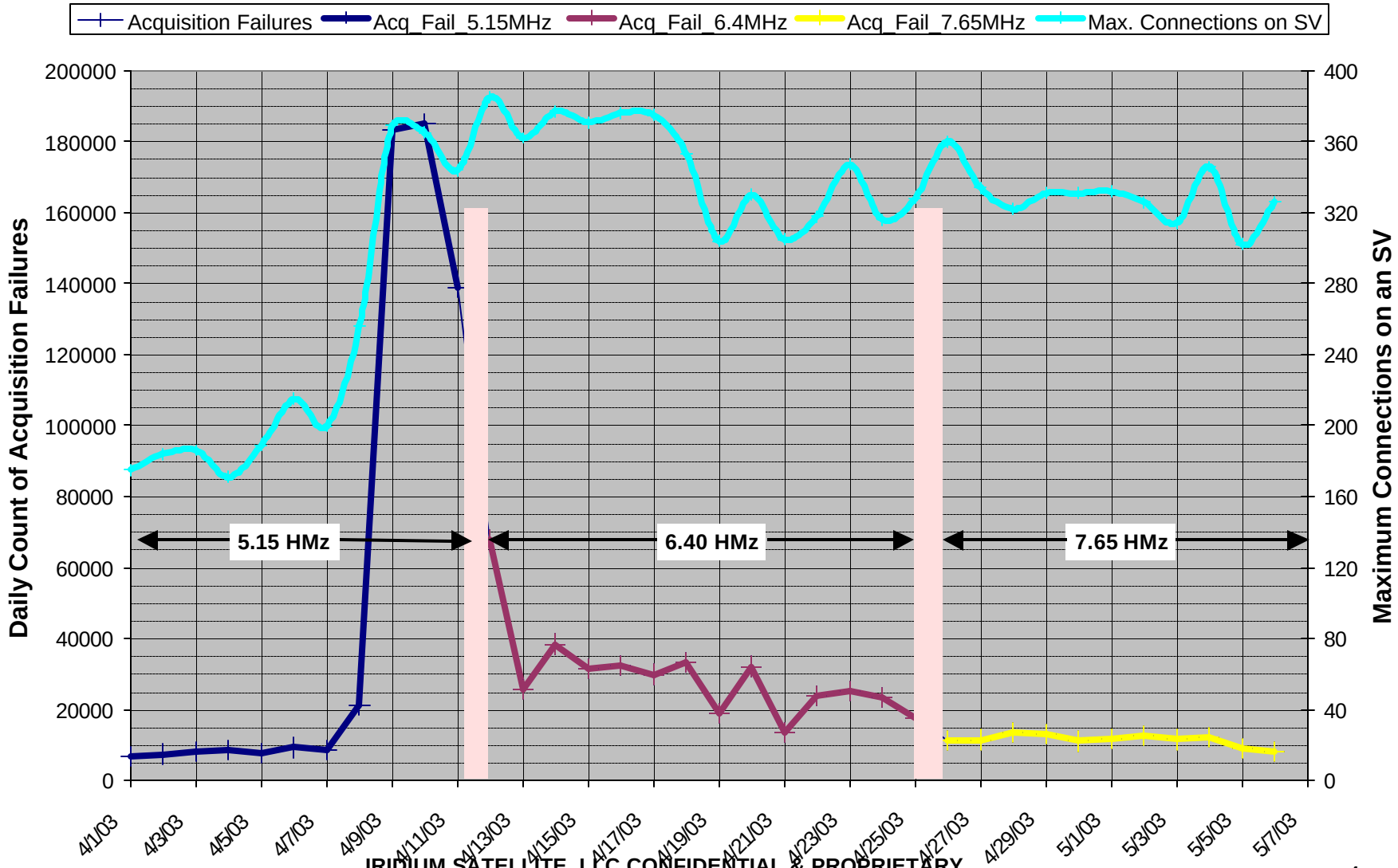


Attachment 4 -- IRIDIUM Performance Issues

RIDIUM

- **The graph below illustrates the Acquisition Attempt Failures per Day – Explicitly Due to "No Band Channel." This satellite counter explicitly records all acquisition attempts which can n be granted SOLELY due to insufficient L-Band resources (Lack of available spectrum).**

System Acquisition Failures - No Channel Available April 1 - May 6 2003

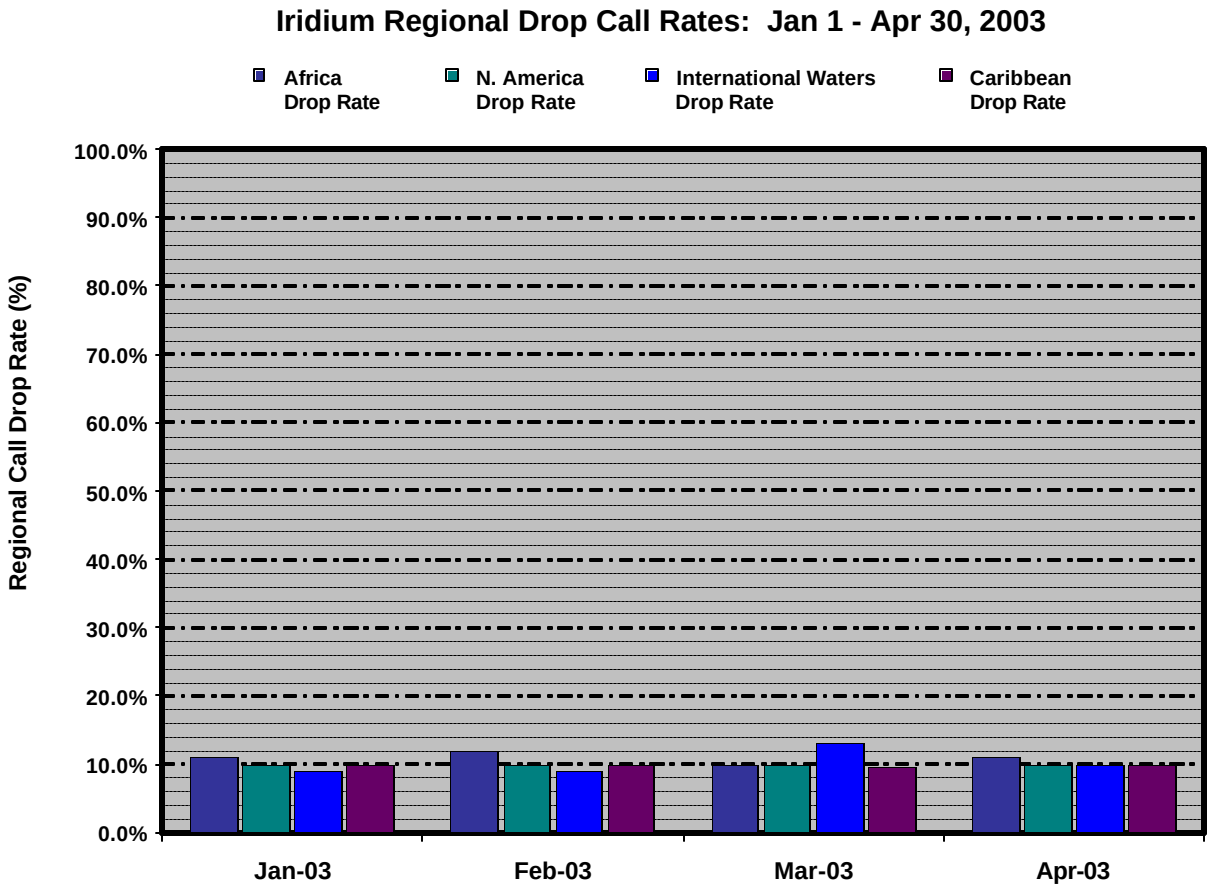


Attachment 5
Iridium Autodialer Data 2003

Iridium AutoDialer Performance Data Summary 2003						
	January			February		
	Attempts	Established	Dropped	Attempts	Established	Dropped
TEMPE Gateway	38331	99.3%	0.2%	34815	99.1%	0.3%
Virginia to DOD Gateway	34613	98.1%	0.3%	32419	98.1%	0.3%
Australia to TEMPE Gateway	30601	98.6%	0.7%	30949	99.8%	0.6%
	March			April		
	Attempts	Established	Dropped	Attempts	Established	Dropped
TEMPE Gateway	32313	99.2%	0.3%	34039	98.4%	0.3%
Virginia to DOD Gateway	33976	98.1%	0.3%	30090	96.9%	0.3%
Australia to TEMPE Gateway	27751	98.6%	0.2%	31138	97.8%	0.3%
Summary Data (all Auto calls)	**391,035**	**98.5%**	**0.3%**			

Attachment 6 -- IRIDIUM QoS: "REAL WORLD"

- In the "Real World" MSS User Service Quality is Affected by Numerous Factors:
  - Signal Degradation Due to Line-of-Sight Obstructions (Much like CMRS Operations)
  - Misdialed Phone Numbers, Low Battery Power, etc.
- Iridium Takes Great Care to Monitor and Trend Real World User Performance on a Daily Basis – and Any Degradations are Analyzed in Detail for Root Cause



CERTIFICATE OF SERVICE

I, William D. Wallace, hereby certify that I have on this 11th day of July, 2003, caused to be served true and correct copies of the foregoing "Joint Comments of L/Q Licensee, Inc., Globalstar, L.P. and Globalstar USA, L.L.C." upon the following persons via hand delivery (marked with an asterisk (*)) or first-class United States mail, postage prepaid:

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Washington, DC 20554

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Commissioner
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The Honorable Michael Copps *
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